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RESPONSE TO COMMENTS RESOURCE CONSERVATION AND RECOVERY FACILITY INVESTIGATION WORK PLAN CNC CHARLESTON SC

7/20/1992

ENSAFE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION
CHARLESTON NAVAL SHIPYARD
CHARLESTON, SOUTH CAROLINA

RESPONSE TO COMMENTS
RFI WORKPLAN
CHARLESTON NAVAL SHIPYARD

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, D.C.

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REMARKS:

9. Ppg 3.1-Hasn't something been done on a management plan?

10. Ppg 3.3-See comment #3.

11. Ppg 3.4.3-Perhaps we should not mention restrictive access of SWMU 2 as it is in routine use.

12. Ppg 3.5 (SWMU #3)-The area is not still denuded. It is grassy.

Bill Book

Bill Book

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CHAPTER 2. BACKGROUND INFORMATION

This section provides a detailed description of the environmental setting and current conditions at the Charleston Naval Shipyard (NSY). Initial sections describe the overall land use, hydrogeographic features, and NSY industrial operations. Section 2.6 focuses on current conditions in each identified solid waste management unit (SWMU). This characterization includes, for each SWMU, a summary of previous investigations and studies, methods of investigation, plans and tables delineating and summarizing data, interpretation of the data, and identification of data gaps.

2.1 LOCATION AND ORGANIZATION. Charleston Naval Base is located on various contiguous and discontiguous properties in Charleston and Berkeley counties on South Carolina's central coast (Figure 2-1). The base is divided into two major areas, Naval Weapons Stations and Naval Base South. Only Naval Base South is covered by the RCRA regulatory activities which are the subject of this RFI Workplan. For purposes of RCRA, that part of Naval Base South situated on the right bank of the Cooper River constitutes a "facility." This part of Naval Base South is referred to as the Naval Shipyard (NSY). While the Naval Shipyard proper is only one of several Naval commands owning property at the base, it controls all of the RCRA regulated activity and has been designated by the Base Commander as having responsibility for implementation of RCRA at the "facility" as a whole.

Naval Base South is located on both banks of the Cooper River, approximately five miles north of downtown Charleston. The installation consists of two major areas: an undeveloped area on the east or left bank of the Cooper River consisting of Daniel Island in Berkeley County which is currently used only for the disposal of dredge spoil, and a developed area on the west or right bank of the Cooper River (Figure 2-2). The developed portion of Naval Base South lies on a peninsula, bound on the west by the Ashley River and the east by the Cooper River. This portion of the base (the "facility") is situated on the east side of the Ashley-Cooper or Charleston peninsula and is bounded on the west, for the most part, by Shipyard Creek. This is the area which will be hereafter referred to as the Naval Shipyard even though parts of it, for non-RCRA purposes, are controlled by other Naval commands.

Naval Base South covers approximately 3,300 acres and is divided between or into several distinct activities or "commands." Of these, Naval Shipyard proper is the largest "landholder" having jurisdiction over the spoil area and the majority of the central third of the developed area on the west bank of the river, approximately 1,958 acres. The southern one-third of the developed area of Naval Base South is controlled primarily by the Naval Station. The Naval Supply Center and Naval Station are the major landholders on the northern one-third of the developed area. Other commands control lesser areas of what shall be referred to generically as the Naval Shipyard (NSY).

2.2 LAND USE. Areas surrounding NSY, like NSY itself, are "mature urban" having been long developed with commercial, industrial, and residential land uses. Commercial areas are located primarily west of NSY; industrial areas lie to the north of NSY and along the west bank of Shipyard Creek.

The west or right bank of Shipyard Creek is concentrated with heavy industry, and has been for many years. Railways have served the area since at least the early 1900s. This, when combined with nearby waterways, has made the area ideal for heavy industry. While ownership has changed from time to time, the land adjacent to NSY remains dedicated to chemical, fertilizer, oil refining, metallurgical, and lumber operations.

Correct page #'s- to include figures. include & check those ref. to figs

No use is made of the shallow groundwater downgradient of NSY since the Cooper River and Shipyard Creek are the base boundaries as well as the downgradient boundaries of the shallow groundwater system. Residential wells using the shallow aquifer upgradient of NSY are unlikely but have not been ruled out. Such wells, if present, would not be threatened by contaminant migration from NSY, since they are upgradient from the base and reversal of the natural gradient by pumpage from shallow residential wells would be extremely unlikely due to the very small capacity of this type of well and aquifer parameters which effectively limit the capture zone of such wells. **A survey of groundwater users within a 7-mile radius of the NSY was provided by the South Carolina Water Resources Commissionin to ascertain the extent, if any, of shallow groundwater usage in the vicinity of the NSY. The survey indicated there are no wells screened in the surficial aquifer being utilized as a source for drinking water within a 4-mile radius of the NSY. Currently, there is no evidence of shallow groundwater usage at the NSY.**

In summary, potential contaminants from installation operations entering the shallow groundwater system do not threaten the health of on-base personnel, since the shallow system is not developed for use at NSY. Likewise, possible offsite contaminant migration via the shallow groundwater system does not threaten human health, since shallow groundwater flow is intercepted by surface waters at the installation boundaries. Contaminants entering the shallow groundwater system at NSY do, however, represent a potential threat to the environment, since contaminants have the potential to migrate via the shallow system to adjacent surface waters. Although aquatic habitats in the Cooper River, Noisette Creek, and Shipyard Creek may be threatened, human health is not directly threatened by contaminant migration, since these surface bodies do not function as potable supplies. Due to low rates of flow in the surficial aquifer and the much higher rates of flow in adjacent surface waters, only concentrated, high level contamination poses this threat to aquatic habitats.

The deeper aquifer (Santee Limestone) is not threatened by potential contamination from NSY. **The permeablities calculated during the Confirmation Study for the uppermost portion of the Cooper Marl indicate this section of the formation is not totally impervious. The Cooper Marl is considered to be essentially impermeable when considering the relative thickness (approximately 250 feet) in the NSY area. In addition, groundwater from the confined aquifer of the Santee Limestone has an upward potential through the Cooper Marl which would also tend to inhibit vertical contaminant migration. Furthermore, metals would likely be absorbed by clays present in the Cooper Marl while organic compounds (such as PCBs) would likely be tightly bound and therefore immobilized by native organic carbon materials abundant in the Cooper Marl.** In any case, water in the Santee Limestone aquifer is not of potable quality in the vicinity of NSY; the aquifer is significantly developed only for non-potable uses.

this is documented somewhere

Migration pathways must also be considered for surface contaminants at NSY since constituents could migrate beyond installation boundaries via stormwater drainage. Stormwater is conveyed by natural and manmade drainage channels to the Cooper River or its tidal tributaries. The northern end of the base drains to Noisette Creek or the Cooper River. The heavily industrialized central portion of NSY drains to the Cooper River. Developed portions of NSY drain stormwater to the Cooper River via storm sewers. Undeveloped areas of NSY are drained by surface flow to either the Cooper River or Shipyard Creek, depending on the drainage patterns of the area. Thus, surface contaminants at NSY have the potential to migrate off the installation and into the Cooper River either directly or through its tributaries. Surface contaminants, therefore, represent a potential threat to aquatic habitats in the Cooper River, Noisette Creek, and Shipyard Creek although they do not directly threaten human health.

2.4 INDUSTRIAL OPERATIONS AND WASTE GENERATION. NSY is an extensive industrial complex containing virtually all shipyard and dockside operations necessary to provide logistical and labor

TABLE 2-1 SOLID WASTE MANAGEMENT UNITS (SWMU)	
SWMU #1	DRMO Building 1617
SWMU #2	Lead Contaminated Area
SWMU #3	Pesticide Mixing Area
SWMU #4	Pesticide Storage Building
SWMU #5	Battery Electrolyte Treatment Area
SWMU #6	Public Works Storage Yard (Old Corral)
SWMU #7	PCB Transformer Storage Area
SWMU #8	Oil Sludge Pit Area
SWMU #9	Closed Landfill
SWMU #10	Hazardous Waste Storage Facility
SWMU #11	Caustic Pond
SWMU #12	Old Fire Fighting Training Area
SWMU #13	Current Fire Fighting Training Area
SWMU #14	Chemical Disposal Area
SWMU #15	Incinerator
SWMU #16	Paint Storage Bunker
SWMU #17	Oil Spill Area
SWMU #18	PCB Spill Area
SWMU #19	Solid Waste Transfer Station
SWMU #20	Waste Disposal Area
SWMU #21	Old Paint Storage Area
SWMU #22	Old Plating Shop Waste Treatment System
SWMU #23	New Plating Shop WWTS
SWMU #24	Waste ~~Disposal Area~~ Oil Reclamation Facility
SWMU #25	Building ~~44~~, Old Plating Operation
SWMU #26	Waste Storage Area, ~~Building~~ 64-40, Pier C
SWMU #27	Waste Storage Area, East End, Pier C
SWMU #28	Waste Paint Sorage Area, West End, Pier C
SWMU #29	Building X-10
SWMU #30	Satellite Accumulation Area, Building 13
SWMU #31	Waste Paint Storage Area, Dry Dock No. 5
SWMU #32	Waste Paint Storage Area, Building 195
SWMU #33	Waste Paint Srotage Area, West End, Dry Dock No.2
SWMU #34	MWR, SW of Building X-10
SWMU #35	Building X-12
SWMU #36	Building 68, Battery Shop

limited to the near surface (Refs. 4, 5, 6 and 10). The spread of lead dust resulted primarily from vehicular traffic during routine operations at the site. Wind-blown dust may also have contributed to the contamination.

The site was under interim status until DHEC issued the Final RCRA Permit to the NSY. Interim status for the DRMO and other SWMUs was therefore terminated on 4 June 1990.

In September of 1989, the inventory of containers was removed from this site and Building #1617 demolished. Empty drums, which have been triple rinsed, are now stored in this area.

The DRMO is currently under review for clean closure based on the risk assessment (Ref. 16). A geometric mean soil lead level of 481.5 ppm has been proposed for lead at this site. However, this is a mean soil concentration and not referenced as a "not-to-be exceeded" concentration for this site.

The site has been extensively studied in connection with its closure. Because the only significant contamination of SWMU #1 is the lead which migrated from SWMU #2, it would be appropriate to address SWMU #1 as part of SWMU #2 under this RFI Workplan. ~~No further action is planned for SWMU #1, however if any additional investigations relative to SWMU #1 are proposed, they will be handled under SWMU #2.~~ If this site is to be included in section 3 delete this sentence

2.6.2 SWMU #2, Lead Contamination Area. The lead contamination area consists of a salvage bin (#3) and adjacent paved ground surface. The area was used to store recovered lead from lead-acid submarine batteries from the mid-1960's until 1984. Electrodes and associated internal metallic components were removed from the battery jars in the battery electrolyte treatment area. Recovered materials were then placed on a railcar and transferred to the DRMO area for storage and eventual sale to a salvage contractor. Lead dust from the recovered materials was released to the salvage bin by handling.

Routine activities (vehicular traffic) in the DRMO yard area and natural processes (such as wind and stormwater flow) caused spreading of the lead contamination into an area which eventually encompassed approximately six acres. Extensive studies of soil and groundwater in the area have delineated the extent of lead contamination at the site (Refs. 10 and 11). A soil sampling investigation was conducted during the Contamination and Exposure Assessment for the lead contamination within DRMO. Seventy-one soil samples were collected from the DRMO site; 35 samples consisted of surficial soils (surface to 0.5 feet depth) and the remaining 36 samples were collected at various depth intervals from 10 individual soil borings (total depths of 7.5 to 10 feet below surface). The surficial soil samples were collected across a grid pattern to characterize the areal extent of lead contamination and the soil boring samples were collected to yield information on the extent to which lead had penetrated (migrated) vertically in the soils (Ref. 10). The locations of the soil sampling points in the DRMO Area are shown in Figure 2-12 and analytical results for the surficial soils are given in Table 2-3.

Lead concentrations in surficial soils vary widely, from less than 1.3 to 371,000 mg of lead per kg of soil. The lead data in Table 2-3 were plotted on a site map (Figure 2-12) to show the areal distribution of the lead contamination and to facilitate estimation of the area of contamination. As shown, lead concentrations are greatest in the area adjacent to and in front (north) of the former battery storage bin (sampling location Nos. SS26 to SS31). Lead concentrations decrease to background levels (10 to 100 mg/kg) over a distance of several hundred feet south of the bin area. The current activity (vehicles, etc.) in the materials storage area north of the bin has apparently spread the lead contaminated soil over a large area. The area encompassed by the 1,000 mg/kg isopleth shown in Figure 2-12 is estimated at six acres. Additionally, stormwater runoff

from monitoring wells WPA-1 and WPA-2 (see Figure 2-13) to determine whether past practices of pesticide mixing and equipment rinsing had affected the shallow groundwater. The samples were analyzed for pesticides, herbicides, PCBs, and arsenic. The laboratory results, which are presented in Appendix E, show that the concentrations of all of the above parameters were below method detection limits and that the pH of the groundwater is approximately six (Ref. 12).

A soil sampling program was conducted at the pesticide mixing area in February, 1982. A total of eight samples were collected at the four locations shown in Figure 2-13 and analyzed for arsenic, herbicides, pesticides, and PCBs. The results of the analyses are presented in Appendix E. Odd numbered samples were collected at a depth of six inches, and even numbered samples were collected at a depth of two feet.

Concentrations of arsenic in the soil ranged from 1.1 **μg/g** (micrograms per gram) in PA-4 to a high of 6.3 **μg/g** in PA-1, and analyses for herbicides 2,4-D and 2,4,5-TP indicated that the levels of these constituents in the soil were less than the detection limit.

The eight soil samples were each analyzed for 18 pesticides, and up to six pesticides were detected. Three of the six pesticides are interrelated in that DDD and DDE are metabolites of DDT and are formed during the biodegradation of DDT. The fact that these were found in all eight samples is significant since DDT has not been in general use for about 15 years; therefore, they represent compounds that may have been present in the soil for a long period of time. Three other pesticides were found in samples PA-3 and PA-7, including heptachlor, beta BHC, and delta BHC.

The eight soil samples were also analyzed for seven PCB compounds, and six of the samples were found to contain one of these compounds, Aroclor 1260.

In May 1982, personnel from the Navy collected two samples of the uppermost soil within the pesticide mixing area. The results of 1.48 **μg/g** and 5.3 **μg/g** (see Appendix E) indicate that the greatest concentration of DDT in the soil is in shallow surface soils. These data, along with the previous data collected at the pesticide mixing area, show that the concentration of DDT in the soil is highest at land surface and decreases rapidly with depth (Ref. 12). The only contaminants of concern are arsenic and DDT. The actions levels established in the Federal Register (Appendix C) for arsenic is 80 ppm and DDT is 3 ppm. The maximum concentration for arsenic 5.3 ppm is well below the action level. DDT and its metabolites (DDD and DDE) were assayed in eleven soil samples and two water samples.

Only one DDT grab sample collected from the surface (0-2 inches) had a concentration of 5.3 ppm, exceeding the action level. All other samples collected were below 1 ppm. Residual pesticide concentrations in the soil are low and slightly exceed the action level. Also, no contaminants were detected in the groundwater samples. Therefore, no additional investigations are recommended under this RFI Workplan.

2.6.4 SWMU #4, Pesticide Storage Building. The pesticide storage building has been used to store various insecticides and rodenticides since 1980. It is a steel building with a concrete floor. The building is equipped with a formulation and mixing room. Sink and floor drains within the building are connected to the sanitary sewer system or to blind sumps (sumps with no outlets). An equipment rinse area/wash rack is located adjacent to the storage administration facility. No evidence of contamination were found or have been reported for this site. ~~The building and concrete floor have since been removed and the area is now a paved parking lot.~~ No additional investigations are recommended under this RFI Workplan.

delete Building 381 is still there and in use

east of the concrete pad was remediated during expansion of the cold storage warehouse in 1986 (see Section 2.6.6). The necessary additional delineation at this unit is described in Section 3.8 of this RFI Workplan.

2.6.8 SWMU #8, Oil Sludge Pit. Oil sludges produced by industrial activities at NSY from 1944 to 1971 were disposed of in three unlined pits near the Warehouse Administrative Building. These pits are visible in aerial photographs taken in 1944 and 1951 and are collectively known as SWMU #8. Heavy rains occasionally caused the pits to overflow, creating oil spills in low areas adjacent to the pits. Two of the pits had been covered with fill by 1956, potentially trapping oil within the subsoils. Free oil is known to have been pumped from the remaining pit in 1974. Clean fill was then brought in and compacted within the pit. Portions of the area have now been converted into a parking lot. A ditch dug at this site in 1982 intercepted free oil floating on the water table. The ditch was dammed immediately afterwards and later filled to prevent migration of oil into Shipyard Creek.

During the Confirmation Study, two soil boring investigations were conducted. During Phase I, shallow borings were installed in the reported vicinity of the abandoned oil-sludge pits. The field investigation was expanded during Phase II after oil was discovered in a section of a newly-dug ditch located as shown in Figure 2-18.

Monitoring wells were installed by Geraghty and Miller in 1982 to assess the extent of oil in the subsurface (Ref. 12). A substantial quantity of free phase oil was floating on the water table. Water samples were collected from two of the wells installed in the area, wells OPW-1 and OPW-3 (Figure 2-18). Well OPW-2 was not sampled due to the presence of free phase oil. Samples were analyzed for sulfate content, 14 volatile organic compounds, and PCBs (see Appendix H). Wells OPW-1 and OPW-3 contained less than 1 and 780 mg/l of sulfate and 0.84 and 0.17 mg/l of methylene chloride, respectively. Methylene chloride is a common laboratory artifact. PCBs were not detected in the water sampled from OPW-3. However, the well OPW-1 sample contained 0.04 μg/l of PCB (aroclor 1260).

Within the area of the abandoned oil-sludge pits, a total of 87 shallow borings were drilled to determine the areal extent of oil in the ground. Six borings were also drilled along the Cooper River to determine if oil seeping from these pits had moved toward the river. Because oil floats on top of the water table, the borings were drilled to the top of the water table which occurs in the area at an average depth of approximately four feet.

From the results of the boring program, it was determined that a long, narrow plume of free oil exists in the southwestern portion of the oil-sludge area. This area is approximately 50 ft wide by 600 ft long and trends in a northeast-southwest direction. Measurements taken in borings and in well OPW-2 indicate that the oil ranges in thickness from about two to four inches. East of the free floating oil plume is a small area containing oily residues. The remaining portions of the oil-sludge area were found to be free of oil (Ref. 12). Morphology of this plume reflects the shape of the underlying abandoned pit. The low hydraulic gradient, the low permeability of the surrounding soils, and the high viscosity of the oil within the soils may have limited the potential for oil migration.

This SWMU has been covered with fill and the area is currently being used for a parking lot. However, oil is reportedly trapped in the subsoil and could potentially migrate towards the Cooper River or Shipyard Creek. The data provided by Geraghty and Miller (Ref. 12) characterize only the free floating oil in the groundwater. The free floating oil plume, dissolved phase plume, and constituents of the oil from each pit have not been characterized, nor have the site hydrogeologic conditions been adequately defined. Since potential migration of this plume to nearby surface waters could create a sheen in violation of

applicable water quality criteria, the soil and groundwater contamination should be delineated and remediated. A soil and groundwater sampling plan designed to accomplish this goal is described in Section 3.10.

2.6.9 SWMU #9, Closed Landfill. From the 1930's until 1973, many solid wastes generated at NSY were disposed of onsite in a landfill located in the southwestern portion of the peninsula. Originally, the area was marshland. Items reportedly disposed of in the landfill include: asbestos, acids, PCBs, waste oils, waste solvents, waste paints, paint sludges, mercury, metal sludge, acid neutralization sludge, various inorganic and organic chemicals, sanitary wastes, office wastes and rubbish. Table 2-8 is a list of the industrial waste disposed of in the closed landfill. The largest volume of wastes consisted of office wastes and rubbish. Liquid wastes were placed in drums before disposal and combustible wastes were burned daily. Residue from the burning was pushed into the marsh as fill along with concrete rubble, metal scrap, and other non-combustible materials. Waste materials were covered with soils when they were available. Soils from onsite building excavations, soil dredged from the river, and bottom ash from the power plant were used as cover materials. Much of the site is currently paved and used as a parking lot.

NOT true

NSY has installed 17 groundwater monitoring wells in and around the landfill to characterize the chemical quality of the groundwater in the vicinity. Some of the wells were initially sampled during July, 1981. The samples were analyzed for several physical and chemical parameters. Additional sampling was performed in February, 1982, and analyses were conducted for inorganic and organic priority pollutants. The complete results of these sampling efforts are reported in Appendix I-1. Table 2-9 summarizes the data for constituents reported above analytical detection limits in all monitoring wells. Several trace metals and chlorinated organic compounds are present in the groundwater in the vicinity of the landfill. These constituents likely reflect past disposal of metal plating sludges, waste chemicals, and industrial degreasing solvents disposed in the landfill (Ref. 9).

A second geotechnical and environmental investigation for the proposed new Fire Fighting Training Facility was performed by Westinghouse Environmental and Geotechnical Services (Ref. 17) in April, 1991. Five test pits and four shallow groundwater monitor wells were constructed at the proposed new training facility site (Figure 2-19). Soil and groundwater samples were analyzed for volatile organic and semi-volatile organic compounds, RCRA metals, and pH.

The laboratory results of the soil samples indicated elevated levels of some metals and organics in all soil samples collected. A summary of the soil sample results which were identified above the method detection limits are identified in Table 2-10. Appendix I-2 presents the test pit observation logs and analytical data. Lead was found to be elevated in all five samples. Other metals which were found to be elevated included chromium, arsenic and barium. The highest metals concentrations were detected in test pits TP-2 and TP-2A. The other test pits were found to contain only lead, with the exception of test pit TP-8 where 49 mg/kg of chromium were detected. The organics which were detected were, for the most part, petroleum derivatives. In addition, some constituents which are typically found in plastics were also identified. The petroleum constituents which were identified were typical of heavier products. This could indicate either that the wastes contained heavier product types (fuel oil, waste oil, bilge water, etc.) or that the light constituents (i.e., gasoline) have volatilized over time. The plastics constituents identified are typical of landfilled wastes (plastic bags, rubber, etc.).

The laboratory results of the groundwater samples (Table 2-11) indicated that the groundwater has been impacted. As with the soil samples, most of the organic constituents detected were petroleum derivatives. However, some chlorinated solvents were also detected including 1,1,1-Trichloroethane and Trichloroethene.

Of the organic constituents detected in the groundwater, of most concern is benzene. Benzene is identified in monitoring wells CSY-FMW-2 (20 μg/l) and CSY-FMW-4 (6.9 μg/l) which are both above the drinking water standard of 5 μg/l. The other organic constituents were found at relatively low levels. Various metals including copper, zinc, antimony nickel, lead, and selenium were detected above the method detection limits in the groundwater samples although none of the established drinking water standards were exceeded.

Monitoring well gauging results from 10 February 1982 suggest that a groundwater ridge exists along an east to west trending axis across the central portion of the site. Hence, groundwater flow appears to be northerly within the northern part of the closed landfill area and southerly over the southern portion of the site (Figure 2-19). A comparison of the landfill soil and groundwater analytical data with the EPA proposed action levels and MCLs shows that most of the constituents are below the proposed action levels. However, the previous investigation was of limited scope. Additional delineation of soil and groundwater contamination is proposed in Section 3.7 of this RFI Workplan.

3.11

2.6.10 SWMU #10, Hazardous Waste Storage Facility. The new hazardous waste container storage and transfer facility was completed in October 1986. The facility was constructed to serve the entire base and is managed by the shipyard. Current status of the unit is that of a permitted storage facility with permission to store wastes for a maximum of 90 days. The building contains seven storage bays. Each bay has separate spill containment berms to allow flexibility in segregating incompatible wastes.

The hazardous waste storage facility is designed to store hazardous materials/wastes until time of proper disposal. A 6-inch high concrete ramp is located at the entrance to each storage bay for spill containment. Storage bays are separated by interior partition walls. A catch basin for spill and storm drainage is located in the exterior load/unload area. Wastes stored in the facility are grouped into eight categories: (1) flammable liquids, (2) acids, (3) alkalis, (4) chlorinated hydrocarbons, (5) oxidizers, (6) reducers, (7) general wastes, and (8) PCBs. These general classifications are reflected on signs used to identify the contents of each storage bay. The unit is constructed of concrete with sloped floors bounded by curbs in order to isolate leaks or spills within each storage bay.

There is no evidence of a release from this unit. No action is planned in this Workplan to be taken at this unit.

2.6.11 SWMU #11, Caustic Pond. The caustic pond, located near the junction of Bainbridge Avenue and Viaduct Road, was used for the disposal of calcium hydroxide $Ca(OH)_2$ from the early 1940's through the early 1970's. The site and adjoining areas are currently covered with vegetation. No signs of impairment can be observed in the area.

Calcium hydroxide was generated as a byproduct during the reaction of water with calcium carbide to produce acetylene gas. Water saturated with $Ca(OH)_2$ was discharged to and allowed to settle in the pond during operations. Supernatant was discharged to Shipyard Creek. The quantity and areal extent of the original $Ca(OH)_2$ deposits are not precisely known. Soil borings conducted during the initial assessment studies found sludge depths of up to one foot (Ref. 9). Water infiltrating into the surficial groundwater through $Ca(OH)_2$ should have a high pH. Samples collected from the monitoring wells around the site, however, show that groundwater is neutral in pH (Ref. 12).

Four monitoring wells were installed in the area of the caustic pond during the Confirmation Study conducted at NSY. Water samples were collected from each of the four monitoring wells (Figure 2-20) to assess the impact of the disposal of calcium hydroxide on the shallow groundwater environment. The

impacts via groundwater pathways has not been adequately characterized. Section 3.14.2 of this RFI Workplan includes a description for further investigation to be performed at this site.

2.6.15 SWMU #15, Incinerator. The incinerator is located adjacent to the pistol range and consists of a primary burning chamber and a 30-foot high stack. The unit is used only for burning of classified documents. Incineration activities occur approximately twice per week. Residues from incineration operations are placed in waste disposal containers and disposed of along with other NSY solid waste. The unit is situated on a concrete pad. Since the incinerator burns only paper, no hazardous residues are generated. No releases have occurred at this unit. No additional investigations are planned for this RFI Workplan.

2.6.16 SWMU #16, Paint Storage Bunker. The paint storage bunker was used briefly, and without proper authorization, for paint container and miscellaneous material storage piles. It was located at an ammunition magazine adjacent to the Cooper River. The storage piles contained paint, paint thinner, oil containment booms, wooden crates, and buoys (Ref. 2). The site was clean closed on the day it was brought to management attention, during a DHEC site inspection. No additional investigation is planned.

2.6.17 SWMU #17, Oil Spill Area. The oil spill area is located beneath Building FBM61 (Figure 2-22A). The spill occurred in June 1987 when an underground pipe supplying No. 2 diesel fuel to the boiler in Building FBM61 ruptured, spilling a small amount of its contents into the basement of the building and several thousand gallons into soils beneath the building. Some of the oil entered drainage sumps beneath the building, entered the storm drainage system, and discharged into the Cooper River. The resulting slick was promptly contained. Remediation efforts subsequently removed all floating oils from the water table.

Building FBM61 was built in 1961 as a Submarine Training Center. Electrical transformers were installed to serve the center at that time. Several samples collected from the spill area were found to contain PCBs (see Figure 2-22A and Table 2-12). The quantity and source of PCBs beneath the building remain uncertain. PCBs from the transformers were probably released many years ago before the area was paved. The entire area is capped either by the building or an adjacent paved parking lot. Consequently, there is no current potential for exposure. However, data gaps exist concerning the full extent of subsurface impacts resulting from the spill. Section 3.15.1 of this RFI Workplan describes additional soil and groundwater sampling planned for this unit.

2.6.18 SWMU #18, PCB Spill Area. The PCB spill occurred at Building 1278 on 12 June 1987 while a PCB-containing transformer destined for disposal was being loaded onto a truck. The loading accident resulted in discharge approximately 75 gallons of insulating fluid (Pyranol) from the unit onto unprotected ground. The contractor immediately placed a drip pan under the transformer to catch the flow of additional fluid. Three 55 gallon drums of fluid were drained from the transformer by response personnel. Steps were then taken to contain the spill area via installation of trenches and construction of a clay absorbent berm north of the spill to prevent migration of liquids into the storm drain. The spill area and other features are shown in Figure 2-22B. Twenty-two drums of oil saturated soils/absorbents and asphalt were excavated and hauled offsite for disposal. The spill area was covered with plastic sheeting.

Visibly contaminated soils were removed directly after the spill. Subsequent sampling of the area, however, showed additional excavation of soil was necessary. An additional 85,000 pounds of soil were removed from the spill site and disposed of in June 1987. Soils were resampled following this excavation and again revealed unacceptable levels of contamination. On 5 August 1987, additional soils were excavated and disposed of. Five confirmation samples were retrieved and analyzed for PCB's. These results indicated that additional excavation was required. **These laboratory results are included in Appendix O along with a**

units?

TABLE 2-13
EVALUATION OF EP TOXIC METALS CONTENT
IN WASTE PAINT STORAGE PAD (ppm)

	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER
EP TOXICITY THRESHOLD	5.0	100	1.0	5.0	5.0	0.2	1.0	5.0
SAMPLE PAINT CHIPS FROM PAD								
WPP-1	0.002	0.170	0.002	1.020	0.050	0.001	0.002	0.010
WWP-2	0.002	0.230	0.002	0.430	0.050	0.001	0.002	0.010
SAMPLE PAINT CHIPS FROM SURROUNDING SOIL								
PC-3	0.002	0.120	0.002	0.020	0.050	0.001	0.002	0.010
PC-4	0.002	0.350	0.002	.250	0.050	0.001	0.002	0.010

Table taken from Reference 5

walls of the building. **An inspection of the secondary containment in July 1992 by SOUTHDIV personnel did not reveal any cracks in the structure through which potential spills could escape. No incident reports pertaining to SWMU #23 have been recorded on file with the NSY since the new plating shop began operation in 1983.**

No evidence of a release from this operation has been found and no additional investigations are planned under this RFI Workplan.

2.6.24 SWMU #24, Waste Oil Reclamation Facility. The waste oil reclamation facility is located in the south-central portion of the shipyard and has been in operation since 1950. This unit consists of two storage/separation tanks identified as Tanks 39-A and 39-D. Waste oils unloaded from ships or from base operations are pumped into this facility via underground pipelines. Gravity oil-water separation occurs inside the tanks which are operated in alternation. The water phase is drawn off and discharged to the sanitary sewer system and the recycled oil is reused at the base. All underground lines are cathodically protected and all lines are annually pressure tested. **The annual line pressure test results are presented in Appendix N. These results indicate a leak was detected on 4 June 1992 in one of the lines which supplies tank 3906 O located at the Chicora Tank Farm. The spill area at the Chicora Tank Farm was remediated when the contaminated soils were excavated and disposed of offsite. Tank 3906 O is connected to the waste oil reclamation operation, however it is located on a discontiguous property and is not covered under the Part B Permit. Futhermore, the piping which serves the Chicora Tank Farm operates independently of the piping which serves tanks 39-A and 39-D. No additional investigations are planned under this RFI Workplan.**

Need additional information concerning the flow processes of the system.

2.6.25 SWMU #25, Building 44, Old Plating Operation. The old plating operation occupies the northern portion of Building 44. Phased out of operation in 1983, the unit was replaced by a new (non-cyanide process) plating operation (SWMU #23). The interior of this unit still contains all operation equipment from the plating process (tanks, vats, ventilation hoods, mechanical and ancillary equipment). Before the plating operation was deactivated, all vats and tanks were emptied and the waste removed. Areas of concern for this SWMU are deteriorated concrete flooring, product accumulation around tanks, the floor drainage system, interior surface contamination, subsurface soils and groundwater.

An environmental study of the abandoned Building 44 Electroplating Facility was performed by Davis and Floyd, Inc. in April, 1991 (Ref. 15). **A copy of this report has been included as Appendix M.** The purpose of the study was to determine necessary actions prior to building demolition. Samples were collected primarily from the process tanks so that interim corrective measures to remove the tanks could begin. Several samples were also collected from an overhead structure, wall, floor and floor drain (Figure 2-24).

Sample results for each area contained high levels of metals contamination. These data are included in Appendix M. Total metals analysis ranges are:

Silver	< 1.0 to 145 ppm
Cadmium	2.02 to 84340 ppm
Chromium	18 to 11940 ppm
Nickel	0.63 to 2.7 ppm
Mercury	6.7 to 446000 ppm

Space	Lead	<0.08 to 6920 ppm
	Cyanide	83 to 129100 ppm

TCLP analysis performed on samples also exceeded the regulatory limits for barium, cadmium, and chromium. Although this extensive sampling program has identified contamination in the building interior, contamination of subsoils and groundwater beneath the area of operation has not yet been documented. Visual observations of the floor and drainage system indicate a high potential for subsurface contamination.

Subsurface contamination around the waste treatment tank, SWMU #22, revealed high levels of chromium and cadmium contamination (See Section 2.6.22). However, although the treatment tank is the most obvious source, contributing factors may include spillage and leaks from Building 44, underground ancillary piping, or leakage and migration from the floor drain system.

An investigation and building decontamination is proposed for this SWMU. A phased approach delineating potential contamination on the building's concrete floor, subsurface soils, and groundwater will be required to determine the effort required for remediation. This SWMU is fully addressed in Section 3.19 of this RFI Workplan.

2.6.26 SWMU #26, Waste Storage Area, Building 64-40, Pier C. This area is approximately 100 square feet of asphalt pavement located on the east side of Building 74 in a heavily industrialized area near Pier C. Six 55-gallon drums of waste (seam filler, lead waste, adhesive waste, alcohol rags, and trichloroethane rags) were temporarily stored here without proper authorization. The area was clean closed on the day it was brought to management's attention, during the DHEC and EPA site inspection.

No releases occurred at this unit. No additional investigation is planned.

2.6.27 SWMU #27, Waste Storage Area, East End, Pier C. This paint storage area is a satellite accumulation area located at the east end of Pier C. The unit comprises approximately 200 square feet of the concrete pier. A flammable storage shed and lockers store virgin paints, enamel thinners and fire retardants used for ship repair. Waste containers from the operation are accumulated beneath a canvas tent. The floor is canvas covered plywood surrounded by a berm. Bermed areas at this unit include 55 and 30-gallon drum containers and a storm drain.

During the DHEC and EPA site inspection, containers of hazardous wastes were either not labeled or had no accumulation dates. Also, there were no inspection records for the unit. As a result of the large number of shops and numerous employees in the shipyard, implementation of established hazardous waste procedures for handling waste material have been difficult to implement fully at some of the shops. Additional training and inspections are required for the areas in violation. As previously described in Section 2.4, the NSY Environmental Division has established a zone inspection system to regularly perform site inspections. Incident reports are written up and notification of deficiencies is submitted to the shop heads for corrective action.

Although there are paint stains on the surface, none are in proximity to the storm drain which is actually a grate through which storm runoff falls directly into the Cooper River. Subsequent to the suprise inspection, satellite waste accumulation practices at this area have been discontinued. The RFI will address sampling of the sediments of the Cooper River beneath the drain grate to determine if a release attributable to this SWMU has occurred.

This site was indicated by CNSY to still in use.

The high lighted items have been completed. Please make this change.

completed

and maintenance measures are planned for this unit. Spill control measures and equipment such as concrete bermed area with roof, drip pans, signs, inspection records, and waste pickup schedule are planned. **Additional investigation of this SWMU is warranted to evaluate if potential impacts to the environment have occurred.**

delete concrete bermed area

have these been completed

<u>2.6.31 SWMU #31, Waste Paint Storage Area, Dry Dock No. 5.</u> This unit is a satellite accumulation area located in Dry Dock No. 5. The area, 200 square feet in size, performs the same functions as SWMU #26. Located on the concrete floor of the drydock near the center of the north wall, the unit is used intermittently to service submarines in drydock. A tent is erected over canvas covered plywood with sand bag berms. Paints are thinned and placed in one gallon buckets with plastic liners for transport to the submarine. A trench drain directly behind the unit is part of the intake system to drain the drydock once the ship has entered.

Comments made during the inspection by DHEC and EPA noted two 55-gallon drums of waste paint, solvent rags, and thinners stored onsite without proper labelling, date of accumulation, inspection records, or spill control equipment. Numerous spills were also noted in the unit. Additionally, a storage shed was noted as having a bad solvent odor.

No releases have been reported from this unit, however, hazardous constituents have the potential to migrate to surface waters during filling of the drydock with water to remove the ships. According to the written SOP, these wastes are to be removed from the drydock prior to filling with water. The written SOP requires that the drydock will be maintained in such a manner as to limit the potential for release to surface waters. The potential for migration of the paints and thinners is limited since the paints harden and the thinners volatilize before the drydock is filled anyway.

Even though this unit is no longer operational, sampling of sediments in the Cooper River will be addressed in Section 3.25.1.

<u>2.6.32 SWMU #32, Waste Paint Storage Area, Building 195.</u> This waste paint storage area was used as a one time waste accumulation area (without proper authorization) located along Pier F between Buildings 195 and 1802. The unit encompassed approximately 400 square feet of area 40 feet from the edge of the water. The surface is concrete with asphalt to the south.

At the time of the DHEC and EPA inspection, this area contained five 55-gallon drums of paint waste, lead and thinner waste, numerous 5-gallon containers of paint waste, and trash bags with paint and solvent rags. A shipping container, adjacent to the site, was also being used to store containers of paint. None of the containers had the proper labelling or markings; date of accumulation; lids securely closed; or maintained and operated properly to minimize fire, explosion, or a sudden release of hazardous waste to the environment. In addition, a corroded area in the shipping container allowed liquids to leak from the shipping container into a storm drain.

An inspection of this unit by SOUTHDIV revealed the waste and shipping container had been removed from the area. A subsequent investigation performed by WAPORA confirmed SOUTHDIV's inspection that this area was no longer used for storage.

This unit was a one-time accumulation area and the containers stored here were removed from the area immediately after the investigation. Even though leakage from the container was a one-time event, the nature of the release was such that soils at the site may have been adversely affected and will be addressed in section 3.26.

Delete

As mentioned earlier, implementation of the established SOP for handling hazardous waste at the Naval Shipyard is still not being properly implemented by some of the shops. Increased zone inspections and enforcement of SOP for handling hazardous waste is priority for the NSY Environmental Division.

2.6.33 SWMU #33, Waste Paint Storage Area, West End, Dry Dock No. 2. The waste paint storage area was used as a one time waste accumulation area located at the western end of Dry Dock No. 2. This unit covers approximately 200 square feet of concrete pavement and is situated 40 feet from the edge of the dry dock. This heavily industrialized area is primarily asphalt with railroad tracks, overhead cranes, heavy equipment, and elevated offices surrounding the dry dock and SWMU area.

The inspection performed by DHEC and EPA revealed two 55-gallon drums of waste paint and waste thinner, numerous 5-gallon containers of paint waste, and trash bags containing solvent rags and paint waste. Spillage was observed in the area. Operation and maintenance procedures to minimize a release were not followed; labelling, accumulation dates, and securing containers were not performed properly as well.

During the time subsequent investigations were performed by SOUTHDIV and WAPORA, the waste material had been removed from the site. In fact, much of the asphalt and concrete had been excavated to overhaul the railroad tracks servicing the dry dock. The RFI Workplan will address sampling activities proposed for SWMU #33 in Section 3.27.1.

2.6.34 SWMU #34, MWR, Southwest of Building X-10. The Morale, Welfare, and Recreation (MWR) (SWMU #34) was utilized as a one time waste accumulation area. This fenced compound, southwest of Building X-10, is 70 feet by 50 feet in size and is primarily soil and grass.

During the DHEC and EPA site inspection, four 55-gallon containers of paint were stored in this area. Several of the drums were reported as leaking with spillage apparent on the ground around them. The containers lacked the proper labelling, date of accumulation, inspection logs, and operations and maintenance procedures to guard against fire, explosion, or releases to the environment. A diesel tank in this area was also observed to be leaking. Closure of the diesel tank was completed immediately after the inspection. Diesel fuel contaminated soils and asphalt were removed and properly disposed of.

Although no surface staining or evidence of a release were observed in this area during the latter investigation, a limited soil sampling investigation will be performed in concert with SWMUs #29 and #35. SWMU #34 will be incorporated into SWMU #29 and #35 to cover the area behind buildings X-10 and X-12, since these are adjacent to one another. Run-off from the asphalt storage area behind building X-10 influences both areas.

2.6.35 SWMU #35, Building X-12. The area on the east side of Building X-12 was used as a one time waste accumulation area. The unit measures approximately 100 square feet in size and is covered in gravel.

At the time of the DHEC and EPA site inspection, five 55-gallon containers and numerous smaller containers of waste paint were stored at this unit. None of the containers were properly labelled, had a date of accumulation, or inspection records. Numerous containers did not have secured lids and spill control equipment was not available.

All improperly stored containers were removed immediately after the site inspection. Each container was handled following the established SOP for hazardous waste transportation, storage, and disposal at the Naval

Shipyard facility. No new containers had been added to the area or any evidence of spills observed during the subsequent inspections of this unit.

This unit was used as a one-time waste accumulation area and does not exhibit the characteristics of having had routine or systematic releases of hazardous waste to the environment. However, as described above, SWMU #35 will investigated concurrently with SWMUs #29 and #34.

2.6.36 SWMU #36, Building 68, Battery Shop The Battery Shop began operation in the early 1940's and is presently in use. The unit is contained inside of building 68 which is approximately 48,000 SF. in size. During normal Battery Shop operations all spills are contained within the building, drained to a holding tank at the south end of the building and pumped to a neutralization pit at Building 1278.

Virgin sulfuric acid and sodium bicarbonate are stored at this site in bulk quantities of thousands of gallons and hundreds of pounds respectively. Various other chemicals are stored in building 68, but in smaller quantities. They are detergents, lacquers, adhesives, penetrating oil, kerosene, dry cleaning solvent, and hydraulic fluid to name a few.

The building's acid tank room floor is elevated about 2 feet above the soil. Drain lines run between the bottom of the floor and the surface of the soil to the edge of the building. From the edge of the building they run below ground to the holding tank.

On two occasions the floor drain to the holding tank separated from the floor allowing approximately 1025 gallons of sulfuric acid to discharge to the soil below the building. Following each spill a sodium carbonate solution was used in an attempt to neutralize the surface below the building.

Further investigation of this facility is warranted to determine if any impacts to the soil and groundwater have occurred due to the acid releases. Details of the investigative activities are outlined in Section 3.31.1.

29

DRAFT

3.0 INVESTIGATIVE ACTIVITIES

This portion of the RFI Workplan details proposed field and laboratory investigations to be performed at the Charleston Naval Shipyard (NSY). The purpose of this work is to fill in gaps in the existing data, resulting in a sufficiently complete characterization of the site's environmental setting, the nature and extent of contamination, and to assess the risks the site may pose to human health and the environment. To meet this objective, the RFI will be conducted in a phased approach that will allow for a continuation of data collection efforts (if necessary) as an understanding of the site is refined. **This approach will include the collection of specific media from those SWMU's outlined in subsequent sections. Phase I of the investigation will be conducted to determine if contaminants are present. Phase II of the investigation will be to more specifically characterize the nature and extent of the contamination. Additionally, if significant levels of contaminants are detected in groundwater a constant rate aquifer test or multiple slug tests will be implemented to aid in remedial design.**

The anticipated duration of field activities should allow time for a preliminary review of analytical data prior to demobilizing field sampling personnel. This will, in essence, allow Phase II field activities to be conducted immediately following Phase I. As described in Section 2.6, data gaps were identified for 26 of the 36 SWMUs. ~~**Fifteen of these SWMU's have been added subsequent to the previous draft of this work plan.**~~ **Groundwater will only be investigated if significant levels of contaminants are identified in Phse I sampling, where specified.** The sections below address the proposed additional investigations for each SWMU, including plans delineating specific sampling locations.

Investigation work elements will include soil test borings, monitoring well installations, groundwater sampling, geophysical surveys, a soil gas survey, and analytical testing. **The geophysical surveys scheduled for SWMU's 9 and 14 have been implemented per previous agreement between SOUTHDIV and USEPA.** The RFI work will be performed in accordance with protocols outlined in the EPA Region IV Standard Operating Procedures and Quality Assurance Manual (SOP) (Ref. 18) and SW-846 (Ref. 21). Key elements of these protocols are highlighted in Section 4.4. The analytical program will similarly be implemented in accordance with accepted methods and a strict Quality Assurance/Quality Control program, as detailed in Sections 4.0 and 5.0. **Although laboratory analytical protocols under RCRA require the incorporation of SW 846 Methodologies, all analytical requirements will adhere to the USEPA 3/90 Statement of Work where possible. Deliverables will be completed under NEESA level C criteria.** Section 7.0 addresses the Health and Safety Plan (HASP), providing health and safety guidance for all RFI site activities.

3.1 Biological

Under the current scope of the investigation outlined below sediment samples are proposed to be collected from the Cooper River and Shipyard Creek. Once the sample results have been reviewed, the need for additional delineation under a Phase II investigation will be evaluated. If high levels of contaminants exist in the sediments ~~of Cooper River~~, then bioassays may be required. In this case, a separate Workplan will be developed and submitted for ecological assessments prior to performance of bioassays. All bioassays will conform to USEPA protocols, specifically, Volume II of the Risk Assessment Guidance manual. Moreover, due to the potential for multiple point sources within the Cooper River which are not associated with the CNSY any investigations addressing potential biological receptors will be SWMU specific. A study of the contaminant concentrations in biota may also necessitate additional sampling of the river sediments upstream and downstream of the site.

3.2 Corrective Action Management Plan

A corrective action management plan will be submitted under separate cover. The plan provides a detailed time table for implementing the proposed additional investigative activities at each SWMU. In addition, it prioritizes the work schedules so that units having the most significant releases will be addressed first.

3.3 SWMU #1, DRMO Staging Area

As outlined in Section 2.6.1 the South Carolina Hazardous Waste Permitting Section (July, 1992) has requested a revision to the closure plan for this unit. Closure for soil is based on risk based scenarios. Therefore, no further soil investigation will be conducted at the DRMO Staging area. To ascertain if groundwater has been impacted from staging operations a groundwater assessment will be implemented. However, due to the close proximity to SWMU #2 the groundwater investigation will address both SWMU's concurrently. The groundwater investigation is outlined in Section 3.4 below.

3.4 SWMU #2, Lead Contamination Area

Environmental conditions in SWMU #2 are described in Sections 2.6.1 and 2.6.2. Pertinent features of this area include a salvage bin (bin #3), surficial dust on adjacent paved areas, contaminated soils adjacent to the paved area, and surface contamination in the soils at SWMU #1 where Building 1617 was formerly located. Prior site investigations have adequately delineated total lead concentrations. Investigations at SWMUs #1 and #2 have included 282 samples of surface and subsurface soils. The NSY is currently seeking clean closure for SWMU #1 under a risk assessment performed

in April, 1991 (Ref. 16). However, certain areas at the DRMO have not been completely delineated. In addition, the effects of Hurricane Hugo may have expanded the area of contamination or reduced the concentrations of the contaminants.

3.4.1 Soil Sampling

An extended sample investigation (ESI) will be required to complete the delineation of lead contamination at the DRMO facility. Verification soil samples will be collected from areas where high concentrations of lead were previously reported. Samples will also be collected from storm water sewers, storm water outfalls, river sediments, and areas where storm water runoff may have transported contaminants beyond the site boundaries.

Figure 3-1 shows the proposed soil sample locations; however, the field scientist will have authority to adjust these locations as conditions warrant. A total of 24 ~~25~~ soil sample stations are planned. Soil samples will be collected from the surface (0 to 6 inches) and one foot interval (6 inches to 1 foot). Data from previous studies (Refs. 5 and 10) show that lead contamination exists at extremely low concentrations below the surface interval. ~~Therefore, subsurface~~ samples (deeper than one foot) will not be collected. ~~Seven~~ sediment samples from Cooper River and ~~five~~ storm sewer samples will also be collected.

check Table 3-1

not all located on fig 3-1. correct

All samples will be analyzed for total lead, SW-846 method 7420/7421. ~~Composite samples will also be collected from areas of high lead concentrations and submitted for treatability testing. Treatability testing will be performed to determine if the soils can be immobilized (by solidification/stabilization), enabling consideration of an insitu remedial treatment option.~~

delete treatability testing

identify by number on fig 3-1

3.4.2 Groundwater Sampling

Six monitoring wells will be installed around the pad at the locations shown in Figure 3-1. The purpose of these wells is to determine if soil lead contamination had adversely impacted groundwater quality in the surficial aquifer. Monitoring well MW1 **is anticipated to function** as an upgradient well. MW2 will be placed in the area ~~of known lead~~ concentrations. The remaining monitoring wells, MW3 through MW6, will be placed around the perimeter (north, east and south boundaries) of the site. **One well will serve to identify the potential for impact for past handling practices in the DRMO staging area.** The groundwater will be assayed for lead using SW-846 method 7420/7421.

Gauging of the monitoring wells **will** be conducted on a regular basis **during the field investigation** to allow construction of a series of groundwater surface contour maps for the site. These

maps will **indicate** the directions(s) of groundwater flow in and near SWMU #2. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of any groundwater contamination resulting from the lead contaminated area and the direction and migration rates of potential groundwater plumes. Once this information becomes available, then additional offsite monitoring wells will be proposed, if necessary, to complete the delineation effort.

3.4.3 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil surface and/or groundwater. Utility construction should be minimized and conducted with the proper preventive measures to prevent physical contact with potential contaminants. Restrictive access to the area should be enforced until remedial activities have been completed.

3.5 SWMU #3, Pesticide Mixing Area

SWMU #3 is described in Section 2.6.3 as an area approximately 50 feet by 25 feet which is devoid of vegetation. The previous investigation of this area included the collection of eight soil samples from four sampling locations within the denuded area. The maximum sampling depth during the previous investigation was two feet below ground surface. **To further delineate the vertical extent of soil contamination in the denuded area, these sampling locations will be recreated during Phase I of the RFI by installing shallow soil borings to facilitate the collection of additional soil samples on two foot intervals from a depth of two feet BGS to ten feet BGS or groundwater, whichever is encountered first (i.e. 2-4', 4-6', etc.). Soil samples will be collected from seven additional locations outside the denuded area in an attempt to delineate the horizontal extent of contamination which was not defined during the Confirmation Study. Individual samples will be collected from the 0-1' and 1-2' intervals BGS and at two foot intervals thereafter to a maximum depth of ten feet or groundwater, whichever is encountered first. Three soil borings will be advanced into the uppermost aquifer and completed as shallow monitoring wells. All wells will be installed outside of the denuded area as shown on Figure 3-2. Soil and groundwater samples will be analyzed for volatile organics, semi-volatile organics, pesticides, and RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).**

Soil, reformat, GW, etc.

3.6 SWMU #4, Pesticide Storage Building

Although the Pesticide Storage Building ~~was removed~~ and is currently thought to be a parking lot, (NUMBER??) ~~shallow~~ hand augers will be installed beneath the asphalt (Figure 3-3). The designated sample location will be cored and any asphalt materials

no, this bldg. was not removed

reformat

this is not what is shown on fig. 3-3

Gauging of the monitoring wells should be conducted on a regular during the investigation basis to allow construction of a series of groundwater surface contour maps for the site. These maps will show the directions(s) of groundwater flow in and near SWMU #5. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of any groundwater contamination resulting from the Battery Electrolyte Treatment Area and the transport direction and migration rates of potential groundwater plumes. Once this information becomes available, then additional offsite monitoring wells will be proposed, if necessary, to complete the delineation effort.

Soil and groundwater samples will be analyzed for VOCs, SVOCs, total lead and pH.

3.7.3 Temporary Land Use Restrictions

The site activities should be limited to those which do not disturb the soil or groundwater. Utility construction should be minimized and conducted with proper preventive measures to prevent physical contact with potential contaminants.

3.8 SWMU #6, Public Works Storage Yard

The public works storage yard has been extensively investigated since March of 1988. Samples collected for this unit were collected on 50-foot centers to a depth of three feet. Results of the sample investigations indicated elevated levels of lead contamination in three areas of the site (see Section 2.6.6). These areas are well defined through previous studies and further soil investigation is therefore not proposed.

3.8.1 Groundwater Sampling

A total of seven monitoring wells will be installed during the RFI to assess potential impacts resulting from activities at both SWMUs #6 and #7 (Figure 3-5). Two monitoring wells, WOC-1 and WOC-2, were previously installed during the Confirmation Study in 1982 to assess potential releases from SWMU #7. **These wells could not be located during a recent site visit; therefore, they will be replaced in the RFI. Five additional wells are proposed to be installed to further delineate the extent of groundwater contamination already detected at SWMU #7 and to determine if contaminated soils from SWMU #6 have impacted groundwater. Groundwater samples will be assayed for pesticides, PCBs, and the eight RCRA metals (total metals only). The proposed analytical parameters are intended to encompass all constituents of concern for both SWMUs #6 and #7.**

Gauging of all seven monitoring wells **will be conducted throughout the RFI** to allow construction of a series of groundwater surface contour maps for the two SWMUs. These maps will show the

Cleanup (Ref. 22). The proposed grid and soil sample locations are shown in Figure 3-6. The boundaries for the sample grid were expanded using the results of the composite analysis in Ref. 12. Using the formulas established in the Field Manual, a 94-foot sample radius was calculated. The manual recommends that the largest spill areas (i.e. those having a radius >11.3 feet) establish a 37 point grid design.

The area east of the fence and concrete pad was previously addressed during sampling activities conducted in February 1987. This sampling event was associated with the partial closure of the southern portion of the Public Works Storage Yard and subsequent construction of the cold storage warehouse (Section 2.6.6). The samples identified as A-1, A-2, Area 2-Sample #1, Area 2-Sample #2, STA.100-Area 1, STA.100-Area 2, STA.100-Area 3, STA.100-Area 4, STA.100-Area 5, and STA.100-Area 6 in Appendix F correspond to this area. The laboratory report indicates that no PCBs were present in any of these samples, therefore, the four sample locations illustrated east of the fence in Figure 3-6 will not be collected. The five sampling points located beneath the concrete slab and Building 3902 will not be sampled as well.

The total number of stations to be sampled is 28. Samples from each sample station will be collected at discrete vertical intervals from 0 to 1 foot, 1 to 2 feet and 2 to 3 feet below grade. Samples from the surface interval (0 to 1 foot) will be analyzed first for PCBs and pesticides using EPA method 8080. **If a surface sample exceeds PCB concentrations of 5 ppm or DDT (and its derivatives DDD and DDE) at 2 ppm, then the next deeper interval (1 to 2 feet) will be analyzed. If a sample is less than the 5 ppm PCB or 2 ppm DDT, then the deeper samples will not be analyzed. Based on the grid layout described above, the minimum number of samples anticipated to be analyzed for PCBs and pesticides is 84.**

This is all the samples

3.9.2 Groundwater Sampling

Contaminant migration from the soil to the groundwater has occurred as evident by trace concentrations of arsenic, DDT, PCBs and BHC in monitoring wells WOC-1 and WOC-2. To evaluate the extent of groundwater impacts from SWMU #7, five additional monitoring wells will be installed in SWMU #6 as described in Section 3.4.2. The exact well locations will be selected in the field by a hydrogeologist during installation. Groundwater will be sampled and analyzed for pesticides, PCBs, and the eight RCRA metals (total metals only).

3.9.3 Temporary Land Use Restrictions

The site activities should be limited to those which do not disturb the soil or groundwater. Utility construction should be minimized and conducted with proper preventive measures to prevent physical contact with potential contaminants. Restrictive access to the

to confirm and initially delineate the presence of contamination. Selected samples containing **elevated levels of contaminants as determined during headspace** will be analyzed for RCRA metals, volatile organic and semi-volatile organic compounds, and PCBs. **A maximum of (??) samples per boring will be analyzed for the expanded list of constituents.** The findings from the Phase I investigation will be used to select additional soil sample locations to fully delineate contamination of the site.

should this be minimum with 1 sample/boring?

only 4 are shown on fig. 3-7

3.10.2 Groundwater Sampling

Once the soil sampling program has been completed, six additional monitoring wells will be installed to complement the existing three wells. The purpose of these wells is to determine if subsurface releases from the oil sludge pits have adversely impacted groundwater quality in the surficial aquifer. Groundwater samples will be collected and assayed for TPH, **volatile organics, semi-volatile organics, and pesticides/PCBs.**

Groundwater elevations will be recorded at various times throughout the RFI to allow for construction of a series of groundwater surface contour maps for the site. **Prior to the collection of groundwater elevations and or samples all wells will be monitored for immiscible layers. If immiscible layers are detected the** wells **will** be gauged using an oil/water interface probe so that the thickness of any free-floating petroleum layer can be determined. Groundwater surface contour maps will indicate the direction of groundwater flow in and near SWMU #8. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of any groundwater contamination resulting from the Oil Sludge Pit Area and the transport direction and migration rates of potential groundwater plumes. Once this information becomes available, additional offsite monitoring wells **may** be proposed to complete the delineation effort.

3.10.3 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater. Utility construction should be minimized and conducted with proper preventive measures to prevent release of groundwater contamination. **As outlined in Section 2.6.8 the Oil Sludge Pit Area currently is used for parking.**

at

3.11 SWMU #9, Closed Landfill

The closed landfill is located at the southwestern part of the peninsula NSY. Over the period from the 1930's to the early 1970's, various solid wastes generated at NSY operations were disposed of in this landfill. Previous characterization activities of the site have included installation and sampling of 17 monitoring wells and four test pits (Figure 3-8; Section 2.6.9). Analytical data from sampling of the original thirteen wells (LF1

to LF10; SLF1 and SLF2; and DLF1) is nearly ten years old. The key issue at the closed landfill is determining the extent and magnitude of groundwater impacts from historical and ongoing discharge of leachate into the surficial aquifer. Groundwater analytical data generated to date have shown the presence of low levels of contamination including volatile and semi-volatile organic compound and metals. Additional work proposed in this unit should allow an accurate assessment of the closed landfill's impact upon groundwater quality in the area.

3.11.1 Geophysical Surveys

Geophysical techniques will be used initially at SWMU #9. The purpose of the geophysical surveys is to find buried drums and other metal containers and delineate areas where dissolved ions have altered the electrical conductivity of groundwater.

The initial survey will be conducted with a magnetometer. The purpose of this survey is to detect the presence of buried drums and other metallic debris in the subsurface. The expected range of the survey will be approximately 30 feet below grade. A variable grid spacing will be used for the magnetic survey with tighter spacing in areas where conductive irregularities or anomalies have been found by the resistivity survey. In addition, tighter spacing will also be used to characterize any magnetic anomalies. Although wider spacing may be used in some areas, the distance between transects will be kept low enough to detect a buried 55 gallon drum or several 5 gallon pails.

A resistivity survey **(terrain conductivity)** will follow the magnetic survey. The purpose of the resistivity survey is to detect regions of elevated groundwater conductivity across the site which may be associated with contaminant plumes. **However, the possibility exists that the terrain conductivity survey may be influenced by high chlorides (increased conductivities) naturally occurring in the groundwater and may mask quantitative results.**

3.11.2 Soil Gas Survey

As part of the initial investigation of the closed landfill, **an active** soil gas survey will be conducted to detect areas where volatile organic compounds may be present in the subsurface soils. **Due to the shallow potentiometric surface elevation of the water table aquifer (3-4 feet below ground surface) soil gas probes are anticipated not to exceed four feet in depth. All samples will be collected from above the soil/groundwater interface in the vadose zone. Samples will be analyzed utilizing a field GC coupled with ~~either~~ a Electron Capture Detector (GC/ECD) and a flame ionization detector (GC/FID). Actual analytes will comprise those compounds associated with fuels and fuel blends and chlorinated solvents. The actual compound list will be variable to the subcontractor selected.**

A base map of the closed landfill will be surveyed with a 100 by 100 foot grid system to be used in transecting the site and locating **soil gas** sample points. **The soil gas survey will be incorporated into the investigation for qualitative purposes. The results of the survey will be incorporated into the geophysical survey to try and delineate trends in the data.** Sample station locations will be selected based upon the information gathered from the geophysical survey, historical information on the landfill operations and aerial photographs of the site if available.

3.11.3 Test Trenching

Information gathered from the geophysical and soil gas survey will be confirmed by test trenching. The anomalies identified from the surveys and suspect areas identified through past historical information sources will be confirmed by excavating a trench and making visual observations of the subsurface conditions. **A minimum of one sample will be collected from each test trench** from the affected media (soil, water, drum or sludge).

Areas where contamination is present (i.e., drums) will be delineated by additional test trenching to determine the lateral extent of the disposal area. The number of test trenches will not be determined until the geophysical and soil gas survey are completed.

3.11.4 Soil Sampling

The soil sampling program will be performed during implementation of the soil trenching and groundwater monitoring program. The purpose of this initial phase of investigation is to determine where soils are contaminated and develop a second phase which will completely characterize and delineate the horizontal and vertical extent of contamination in the landfill area. Samples will be collected from soils in the excavated test trench, material leaking from a drum(s) or container(s), sludge or fill material, or any suspect material in the excavation.

The estimated number of samples cannot be determined until the geophysical and soil gas surveys are completed. Samples collected this phase of work will be assayed for RCRA metals, volatile organic and semi-volatile organic compounds, PCBs and pesticides.

3.11.5 Groundwater Sampling

A site survey conducted in the area of SWMU #9 did not identify all the wells installed under previous investigations. Therefore, during the RFI ten additional wells will be installed (Figure 3-8). Soil samples will be collected at two foot intervals during drilling. Representative samples form each interval will be aliquotted as outlined in the investigation at SWMU #8. One sample per boring will be submitted to the laboratory for analysis.

All **existing and new** monitoring wells **will be** sampled for RCRA metals, volatile organics, semi-volatiles, PCBs and pesticides. During the investigation, gauging of all monitoring wells will be conducted on a regular basis to allow construction of a series of groundwater surface contour maps for the site. These maps will show the direction(s) of groundwater flow in and near the closed landfill. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of groundwater contamination resulting from the closed landfill and the direction and migration rates of potential groundwater plumes. **If additional borings/monitoring wells are necessary to delineate any contaminant plumes emanating from the landfill they will be incorporated into Phase II of the investigation.**

3.11.6 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater. Utility construction activities should be minimized and conducted with proper safety measures to prevent release of potential contamination.

3.12 SWMU #12, Old Fire Fighter Training Area

The Old Fire Fighter Training Area consisted of a pit approximately 30 to 50 feet in diameter. The pit was allegedly used between 1966 and 1971. As discussed in Section 2.6.12, during fire fighting training excercises, oil, gasoline, and alcohol were poured into the pit, ignited, then extinguished. In 1971, the pit was cited for an oil spill.

3.12.1 Soil Sampling

To more exactly determine the location of the pit and if subsequent impact from training has occurred a 10 foot grid will be established across the site (Figure 3-9). Soil samples will be collected from each nodal point. Samples will be collected continuously on two foot intervals until groundwater is encountered. If soil contamination is identified or free product is encountered during Phase I, three groundwater wells will be installed in Phase II of the RFI. All samples collected from this site will be analyzed for TPH, volatile organics, semi-volatile organics, and RCRA metals.

3.12.2 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater. Utility construction activities should be minimized and conducted with proper safety measures to prevent release of potential contamination.

3.13 SWMU #13, Current Fire Fighting Training Area

SWMU #13 has been operational since approximately 1973. Although no releases have been observed the potential for release to the sanitary sewer system may exist from the oil-water separator.

3.13.1

To confirm or negate if a release has occurred one sample will be collected from the sewer system (Figure 3-10). If elevated concentrations of contaminants are identified then soil borings will be completed along the sewer line to assess for leakage. Samples will not be collected beyond the juncture of the line which serves the training facility and the main line. All samples will be analyzed for TPH, **volatile organics, semi-volatile organics, and RCRA metals.**

3.14 SWMU #14, Chemical Disposal Area

The chemical disposal area is located at the southern end of NSY in the vicinity of the skeet and pistol ranges. Within this general area, the precise locations of disposals are unknown. Waste materials are thought to have been buried in drums, but may include bagged or bulk wastes.

3.14.1 Geophysical Surveys

Geophysical techniques will be used at SWMU #14 before initiation of the boring and sampling program. The purpose of the geophysical surveys is to find buried drums and other metal containers and delineate areas where dissolved ions have altered the electrical conductivity of groundwater. Results of the geophysical surveys will be used to plan a more efficient soil boring and sampling program.

The initial survey will be conducted with a magnetometer. The purpose of this survey is to detect the presence of buried drums and other metallic debris in the subsurface. The expected range of the survey will be approximately 30 feet below grade. A variable grid spacing will be used for the magnetic survey with tighter spacing in areas where conductive irregularities or anomalies have been found by the resistivity survey. In addition, tighter spacing will also be used to characterize any magnetic anomalies. Although wider spacing may be used in some areas, the distance between transects will be kept low enough to detect a buried 55 gallon drum or several 5 gallon pails.

A resistivity survey (terrain conductivity) will follow the magnetic survey. The purpose of the resistivity survey is to detect regions of elevated groundwater conductivity across the site which may be associated with contaminant plumes. **As outlined in the geophysical survey conducted at SWMU #9, the possibility exists that due to the potential for high chloride concentrations in groundwater elevated**

understanding of the extent and magnitude of groundwater contamination resulting from the Chemical Disposal Area as well as the direction and migration rates of potential groundwater plumes. Once this information becomes available, additional offsite monitoring wells will be proposed (including a "deep" well), if necessary, to complete the delineation effort.

3.14.4 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater. Utility construction should not be conducted until the area has been completely assessed. Limited access to the area should be enforced until remedial activities have been completed.

3.15 SWMU #17, Oil Spill Area

This spill occurred in June 1987 when an underground pipe ruptured which supplied No. 5 NSF fuel oil to the boiler in Building No. FBM61, Figure 3-12. Some samples of oil collected during remediation of the spill were found to be contaminated with PCBs. The location of samples with PCBs and their concentrations indicate that the source of the PCBs is beneath Building FBM61. Beyond the initial remedial actions conducted at the time of the spill and subsequent release to the Cooper River, there has not been a soil or groundwater investigation to delineate the extent and magnitude of potential subsurface oil contamination at the site. Available data suggest that the soil contamination produced by the spill remains underneath the building. In order to fill in current data gaps and ensure that migration of contaminants is not occurring beyond the building area, the following soil and groundwater investigation is proposed for the site.

3.15.1 Soil Sampling

Due to the location of the contamination (primarily beneath Building FBM61), a comprehensive soil sampling program is not feasible. However, soil samples will be collected at the locations of the four proposed monitoring wells using the soil sampling protocols described in Section 4.4.1. Soil borings will be installed with a drilling rig **incorporating hollow stem augering techniques.** Soil samples will be retrieved using a split-spoon sampler. The actual retrieval depths will depend upon the materials encountered; however, the general rationale will be to collect a series of samples which vertically bracket any encountered contamination. **Headspace analyses will be conducted as previously outlined** to assist in field determination of contaminated zones. It is estimated that a minimum of eight discrete soil samples **(2 per boring)** will be assayed by the laboratory for PCBs, Total Petroleum Hydrocarbons (TPH), and Base-neutral compounds.

3.15.2 Groundwater Sampling

The migration potential of PCBs at SWMU #17 is believed to be rather limited. The contaminated area has an impermeable cover consisting of the building and surrounding paved areas and PCBs bind tightly to soils, especially those with a high degree of naturally occurring organic content. However, in order to confirm that any remaining constituents are not migrating into surrounding soils and/or groundwater, four monitoring wells are proposed for locations surrounding the building (Figure 3-12). Monitoring wells MW-2, MW-3, and MW-4 were sited to bracket the ~~area~~ areas where initial samples were taken beyond the confines of the building. MW-1 is designed as an upgradient well.

Monitoring wells will be installed and sampled using the protocols described in Section 4.4.2. Samples will be analyzed for PCBs, TPH, and Base-neutral ~~extr~~actables. **Groundwater elevations for the four** proposed monitoring wells will be conducted on a regular basis to allow construction of a series of groundwater surface contour maps for the site. These maps will show the direction(s) of groundwater flow in and near SWMU #17. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of any groundwater contamination resulting from the Oil Spill Area. **If contaminants are identified in any of the wells additional monitoring wells will be installed during Phase II of the RFI to aid in determining the extent of contamination.**

3.15.3 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater. Utility construction should be minimized and conducted with the proper protection to prevent physical contact with potential contaminants.

3.16 SWMU #20, Waste Disposal Area

The Waste Disposal Area occupies an open area contiguous with SWMU #9 (Landfill). Therefore, during the investigation conducted for the landfill one soil boring to be completed as a monitoring well will be installed in the area (See Figure 3-8). The well will serve in a dual capacity: to identify contaminants which may be emanating from the landfill, and to identify if any releases have occurred in the waste disposal area.

The interpretation of analytical data from SWMU #9 may require the installation of additional monitoring wells at SWMU #20 during Phase II of the RFI. However, if no levels of contaminants are identified in analytical results the proposed well will serve as a "clean" well for both units.

is scheduled to be removed by a contractor before the investigation begins.

3.20.1 Core Sampling

Concrete core samples will be collected inside Building 44 to allow evaluation of the potential for vertical migration of metals contamination into the concrete. Seven 4-inch diameter core samples are proposed to be cored through the concrete. The cores will be divided into 2-inch sections and pulverized for analysis.

3.20.2 Soil Sampling

A hand auger will be used to collect subsurface soil samples, beneath the concrete, form the seven 4-inch diameter holes. A 3-inch diameter hand auger will be utilized to collect soil samples at 1 foot intervals to a depth of 4 feet unless groundwater is encountered first. Laboratory analysis will be performed first on the near surface samples and continue with deeper samples unless non-detectable levels are obtained.

The subsurface soils around the exterior areas of Building 44 will also be sampled. Ten additional sample locations will be selected around the northern and eastern perimeter of Building 44. Subsurface soil samples will be collected at 1 foot intervals beneath the asphalt at the soil/groundwater interface. **These sample locations as illustrated on Figure 3-14 are designed to incorporate SWMU #22 above.**

3.20.3 Groundwater Sampling

Five monitoring wells are proposed for installation at SWMU #25 and the associated waste treatment system, SWMU #22. The potential for constituents to migrate from the site is somewhat higher than at other units due to the metals in reduced pH (<5) conditions. The age of the plating operation and the presence of conduits for transport via the floor drain piping suggest a potential for significant contamination which **further** warrants groundwater testing.

The five groundwater wells will be installed and sampled using the protocols described in Section 4.4. Monitoring wells will initially be installed to characterize site hydrogeology and groundwater contamination (Phase I). **Water elevations will be collected from the monitoring wells throughout the investigation** on a regular basis to allow construction of a series of groundwater surface contour maps for the SWMU #25. These maps will show the direction(s) of groundwater flow in and near the site. Combining the hydrogeologic data and analytical results should allow a better understanding of the extent and magnitude of any groundwater contamination resulting from the Old Plating Operations. The transport direction and migration rates of potential groundwater plumes will also be assessed. Once this information becomes available, then additional offsite monitoring wells will be

minimized and conducted with proper preventive measures to prevent release of groundwater contamination.

3.24 SWMU #30, Satellite Accumulation Area, Building 13

The satellite accumulation area is used to receive waste generated from the Building 13 laboratory. The unit and surrounding area are covered with asphalt. During the inspection of SWMU #30 distinct cracks in the asphalt were observed.

3.24.1 Soil Sampling

One sediment sample is proposed for collection from the catch basin adjacent to the unit (Figure 3-18). In addition, there is an apparent underground storage tank within the area of concern. Four monitoring wells were identified and are presumed to have been installed for monitoring the UST system. To facilitate the RFI, groundwater samples will be collected from each of the four wells and analyzed for volatiles, semi-volatiles, and RCRA metals. The sediment sample will be analyzed for RCRA metals, only.

reformat include GW section

3.24.2 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater with invasive activities through the asphalt. Utility construction should be minimized and conducted with proper preventive measures to prevent release of groundwater contamination.

3.25 SWMU #31, Waste Paint Storage Area, Dry Dock No. 5

The Waste Paint Storage Area (Dry Dock #5) is located within the confines of the dry dock itself. Normal operating procedures for the dry dock would require a sequence of flooding and discharge as ships are brought in for maintenance. Any accumulated waste material would be discharged to the Cooper River.

3.25.1 Soil Sampling

Two sediment samples are proposed to be sampled from the Cooper River and analyzed for RCRA metals (Figure 3-19). Samples will be collected by utilizing a petite ponar dredge.

3.25.2 Temporary Land Use Restrictions

There are no land use restrictions to be implemented near the pier. Care should be taken to minimize the potential for further releases.

3.26 SWMU #32, Waste Paint Storage Area, Building 195

The Waste Paint Storage Area (Bldg. 195) was a one time accumulation area (Figure 3-19). Visual inspection of the unit revealed a depressed area in the asphalt that had accumulated sand/dirt.

3.26.1 Soil Sampling

Adjacent to the storage area is a catch basin. Soil samples will be collected within the depressed area to a maximum depth of three feet at one foot intervals. However, if asphalt or concrete are encountered prior to obtaining the proposed depth, only those samples collected will be submitted for analysis. One sediment sample will be collected from the catch basin and analyzed for RCRA metals. Soil samples will be analyzed for volatiles, semi-volatiles, and RCRA metals.

Phase II sampling will be implemented only if elevated levels of contaminants are identified during the initial phase of the investigation.

3.26.2 Temporary Land Use Restrictions

The site's activities should be limited to those which do not disturb the soil or groundwater with invasive activities through the asphalt. Utility construction should be minimized and conducted with proper preventive measures to prevent release of groundwater contamination.

3.27 SWMU #33, Waste Paint Storage Area, West End Dry Dock No.2

The Waste Paint Storage Area (West End Dry Dock #2) was also used as a one time waste accumulation area (Figure 3-20). During the site inspection spillage was observed at the west end of the dock. There are two catch basins located east and west of the observed release that will be sampled during the RFI.

3.27.1

One sediment sample will be collected from each basin utilizing a stainless steel scoop or hand trowel. Sediment samples will be analyzed for RCRA metals.

3.27.2 Temporary Land Use Restrictions

There are no land use restrictions to be implemented near the pier. Care should be taken to minimize the potential for further releases. Furthermore waste accumulation should be limited to designated areas.

3.28 SWMU #34, MWR, Southwest of Building X-10
SWMU #35, Building X-12

SWMUs #34 and #35 are currently designated to be investigated concurrent with SWMU #29. Figure 3-17 reflects the location of each SWMU and subsequent sampling points. Section 3.23 details the investigative approach.

3.31 SWMU 36, Building 68, Battery Shop

As outlined in Section 2.6.36 the battery shop began operations in the early 1940's and is still in use. On two occasions the floor drain to the holding tank separated from the floor allowing approximately 1025 gallons of sulfuric acid to discharge to the soil below the building. Following each spill a sodium carbonate solution was used in an attempt to neutralize the surface below the building.

The Phase I investigation is designed to determined if the attempts to neutralize the sulfuric acid following the spills were successful and if any contaminants have migrated from under the building. Also, phase I will be used to determine if the spilled acid washed any lead dust, which may have been present, from the floor through the broken drain to the soil below the building. If the laboratory results from phase I indicate the presence of contamination then a phase II sampling program will be conducted to fully define the extent of soil and groundwater contamination.

3.31.1 Soil Sampling

Two soil borings will be installed adjacent to the spill area as shown in Figure 3-21. Soil samples will be collected from the 0-1' and 1-2' intervals. If significant soil contamination exists at the lowermost soil sample interval, a series of soil borings converted to shallow monitoring wells will be installed in Phase II of the RFI. The samples will be analyzed for pH and total lead. If the laboratory results indicate low pH levels and/or high lead levels then a phase II soil sampling program will be conducted with the installation of up to three permanent monitoring wells.

3.31.2 Temporary Land Use Restrictions.

The site activities should be limited to those which do not disturb the soil or groundwater. Utility construction should be minimized and conducted with proper preventive measures to prevent physical contact with potential contaminants.

CHAPTER 5. DATA MANAGEMENT PROCEDURES

The objective of this portion of the RFI Workplan is to describe methods WAPORA will utilize throughout the RFI project to manage collected data.

5.1 GENERAL DOCUMENTATION PROCEDURES. Each field team will have at least one person, generally the site supervisor, who is thoroughly familiar with the appropriate documentation procedures. This person will personally perform or will directly oversee the completion of the documents which accompany the task. Documentation tasks will be performed on a sample-by-sample or item-by-item basis throughout the day. However, items such as shipping containers and sample tags will be prepared in advance.

5.2 FIELD DOCUMENTATION. Sample possession will be traceable from the time the sample is collected to its delivery at the laboratory. In order to identify samples and manage the information, samples will be numbered sequentially by SWMU site and type (i.e., soil, groundwater, etc.).

The following sections describe records and forms to be used to provide documentation and quality control.

5.2.1 Field Log Books. Permanently bound field notebooks will be used to record data and activities performed at each SWMU site. Entries will be described in as much detail as practical. Each notebook will be identified by the project specific document number. The notebook cover will include: project name and number, book number, start and end dates, and the name of the field team whose activities are recorded in the book.

At the beginning of each entry, the date, start time, weather, field personnel present, and activity will be recorded. Additional entries may include geologic logs, drilling records, sample records, and additional data as may be appropriate. Each entry will be initialled by the person making the entry.

5.2.2 Sample Tags. Sample tags will be filled out and attached to each collected sample prior to the time of collection. Label information will be recorded in the Field Log Book as a cross-reference at the time of collection.

5.2.3 Chain-Of-Custody Records. The chain-of-custody record will contain a summary of the contents of the shipment, dates, times, sample numbers, tag numbers, number and volume of containers, and signatures for the transferral of samples.

5.2.4 Subsurface Boring Logs. The subsurface boring logs will be prepared as each boring is advanced. Items to be recorded include materials encountered, depth to water, obvious contamination areas, and any other necessary or appropriate information. A general log also will be recorded in the Field Log Book as a cross-reference.

CHAPTER 6. IDENTIFICATION OF POTENTIAL RECEPTORS

Potential receptors of constituents released at NSY would include users of the surficial aquifer, biota in adjacent surface waters and wetlands (primarily at locations where the surficial aquifer discharges to surface water) and NSY personnel. **Biological receptors will be evaluated only if significant contaminant levels are identified within specific migration pathways as outline in Section 3.1.**

Potential exposure of NSY personnel is limited to specific locations at or in the vicinity of SWMUs. ~~For example, personnel at the DRMO (SWMU #2) may be exposed to airborne lead dust~~. The risk of exposure is low due to the small volume and periodic nature of site activities. This judgement is somewhat confirmed by the results of medical surveillance programs which have not detected lead accumulations in site workers. However, surface lead concentrations in this area exceed generally applied standards. Therefore, the potential for exposure will be further eliminated by implementation of interim corrective measures. Lead contaminated areas are also present at SWMU #6. However, the potential risk for dermal or inhalation exposure is extremely low since the lead contaminated areas are small localized hot spots where current operations are limited.

The highest potential risk for exposure via a dermal or inhalation pathway is SWMU #25. The building may contain heavy metal residues on interior surfaces which are the due to the old plating operation. To limit exposure of personnel in this area, the NSY has secured the building allowing access only when accompanied by proper authorization. The investigation proposed for this site in the RFI Workplan will provide additional data necessary to design a building decontamination and remediation program.

The potential for dermal exposure to various soil contaminants during earth moving activities is also quite remote but more difficult to quantify. At SWMUs #5, #7, #14, and #29, peak constituent concentrations and their precise locations have not yet been fully determined. In the case of SWMU #29, the identity of constituents has not been sufficiently studied. These data gaps and deficiencies will be addressed through the RFI process, as detailed in this Workplan, and remediation programs will be proposed, as necessary.

Another major potential receptor in the area would be existing or potential users of groundwater removed from the surficial aquifer. **A survey of water well users in the area has indicated that there are no potable water wells within a 4 mile radius of the shipyard. In fact, the surficial aquifer does not constitute a usable aquifer for potable water supplies. NSY can ensure that there is no future use of the surficial aquifer through the simple expedient of making a notation on its master engineering site plan.** If required, a deed restriction on groundwater use could be recorded. In any case, while direct groundwater use is a potential exposure route at the NSY, in reality the potential is **minimal to non-existent.**

Groundwater from the surficial aquifer is thought to continuously discharge to wetlands and surface water bodies within and at the boundary of NSY. Significant impacts to potentially affected ecological communities can and should be eliminated. However, as discussed in Section 2.0, most conditions at NSY present little or no potential for significant impacts to ecological communities due to a nearly flat hydraulic gradient, low values of aquifer hydraulic conductivity, and soil properties which prevent or attenuate movement of constituents.

Delete the narrative for I.C.M. @ SWMU #2 per EPA ✓ CMT 6-1.

STATE'S COMMENTS ON THE
RFI WORK PLAN - SEPTEMBER 1991
FOR CHARLESTON NAVAL SHIPYARD
EPA I.D. No. SC0 170 022 560

1. Section 2.6.1

The DRMO Storage Shed, SWMU #1, was an interim status unit and must be closed under the 265 closure standards. Section 2.6.1 states that barium, chromium, nickel, lead and selenium are the only contaminants; however, the Progress Report on Interim Status Facility Closures dated May 1989 showed that cadmium, silver and cyanide are also contaminants. The removal of contaminated soil for this unit should continue to be handled under the interim status closure plan.

2. Section 2.6.6

The Public Works Storage Yard, SWMU #6, was an interim status unit and must be closed under 265 closure standards. Section 2.6.6 indicates that barium, cadmium, chromium and lead are the only contaminants; however, the Progress Report on Interim Status Facility Closures dated May 1989 showed nickel and mercury are also contaminants.

3. Section 7.9.3 Table 7-1

The South Carolina Department of Health and Environmental Control should be added under the heading of National or Regional Sources of Assistance. The telephone number is (803) 253-6488.

Please add

ALSO, BE SURE TO INCORPORATE -
SCDHEC CMT. #5 Included in QAPP
SDIV CMTS
1. Appendix N ✓
2. fig. 4-1
3. INCLUDE THE SAMPLING TABLE. ✓

Insert ~~[illegible]~~ 1 points into Chapter 4 & literature in append

Volatile Organics (µg/l)		BNAs (µg/l)	
Benzene	20.0	Anthracene	1.1
Chlorobenzene	13.6	Acenaphthene	1.3
Chloroform	1.5	Naphthalene	2.2
p-Dichlorobenzene	7.5	2 Methylnphathalene	5.5
1-4, Dichlorobenzene	7.2	Phenanthrene	1.1
Toluene	4.6		
Ethylbenzene	2.7		
TCE	0.4		
TCA	0.8		

3. The anticipated residence time of the sample in the well and the aquifer's productivity.

Response: Each well will be purged immediately before the sample is collected. The anticipated residence time of the water prior to sampling should be ~~less than~~ twenty minutes. The surficial aquifer is estimated to have a transmissivity range of 0.05 to 3.93 m^2/day.

is this range for NSY or Cecil Field.

4. The reason for not using a hybrid well.

Response: SOUTHNAVFACENGCOM feels that PVC is the preferred material when sampling mixed wastes plumes. Stainless steel may adsorb or absorb heavy metals such as lead, chromium and arsenic. Also, the cutting oils used in the manufacturing of stainless-steel riser and screen are difficult to remove. These oils, if not completely removed by the decontamination cleaning, may contaminate the well. Hybrid wells introduce additional problems, such as, the junction is usually a weak point subject to breakage or is a place for down-hole equipment to become ensnared.

5. Literature on adsorption/desorption characteristics of the compounds and elements of interest for the type of PVC to be used.

Response: Three reprints are attached that evaluate the sorptive characteristics of stainless steel and PVC. The study titled "Influence of Casing Materials on Trace-level Chemicals in Well Water" (Parker, 1990), evaluated a number of the chemicals of concern identified in previous investigations at CNSY. However, benzene is one contaminant detected at a concentration above it's respective MCL that was not addressed by the studies. These can be found in appendix ?

6. If an anticipated increase in thickness of the well thickness will require a larger annular space.

Response: No change in the annular space is required.

TABLE 2-1 SOLID WASTE MANAGEMENT UNIT GROUPS			
Group #	SWMU #	Description	
I	SWMU #1	DRMO Building 1617	0
	SWMU #2	Lead Contaminated Area	0
II	SWMU #3	Pesticide Mixing Area	0
	SWMU #4	Pesticide Storage Building	0
	SWMU #5	Battery Electrolyte Treatment Area	0
	SWMU #6	Public Works Storage Yard (Old Corral)	0
	SWMU #7	PCB Transformer Storage Area	0
	SWMU #36	Building 68, Battery Shop*	0
III	SWMU #8	Oil Sludge Pit Area	0
	SWMU #9	Closed Landfill	0
	SWMU #20	Waste Disposal Area*	0
	SWMU #29	Building X-10 ✓	0
	SWMU #34	MWR, SW of Building X-10 ✓	0
	SWMU #35	Building X-12 ✓	0
IV	SWMU #12	Old Fire Fighting Training Area	
	SWMU #13	Current Fire Fighting Training Area*	
	SWMU #14	Chemical Disposal Area	
	SWMU #17	Oil Spill Area	
V	SWMU #21	Old Paint Storage Area	
	SWMU #22	Old Plating Shop Waste Treatment System	
	SWMU #25	Building 44, Old Plating Operation	
	SWMU #27	Waste Storage Area, East End, Pier C*	
	SWMU #28	Waste Paint Storage Area, West End, Pier C	

MWS

6

13

16

9

4

Soil Samples

(13 sed) 52+

(1 sed) 173

55+ (SWMUs 9+ unknown

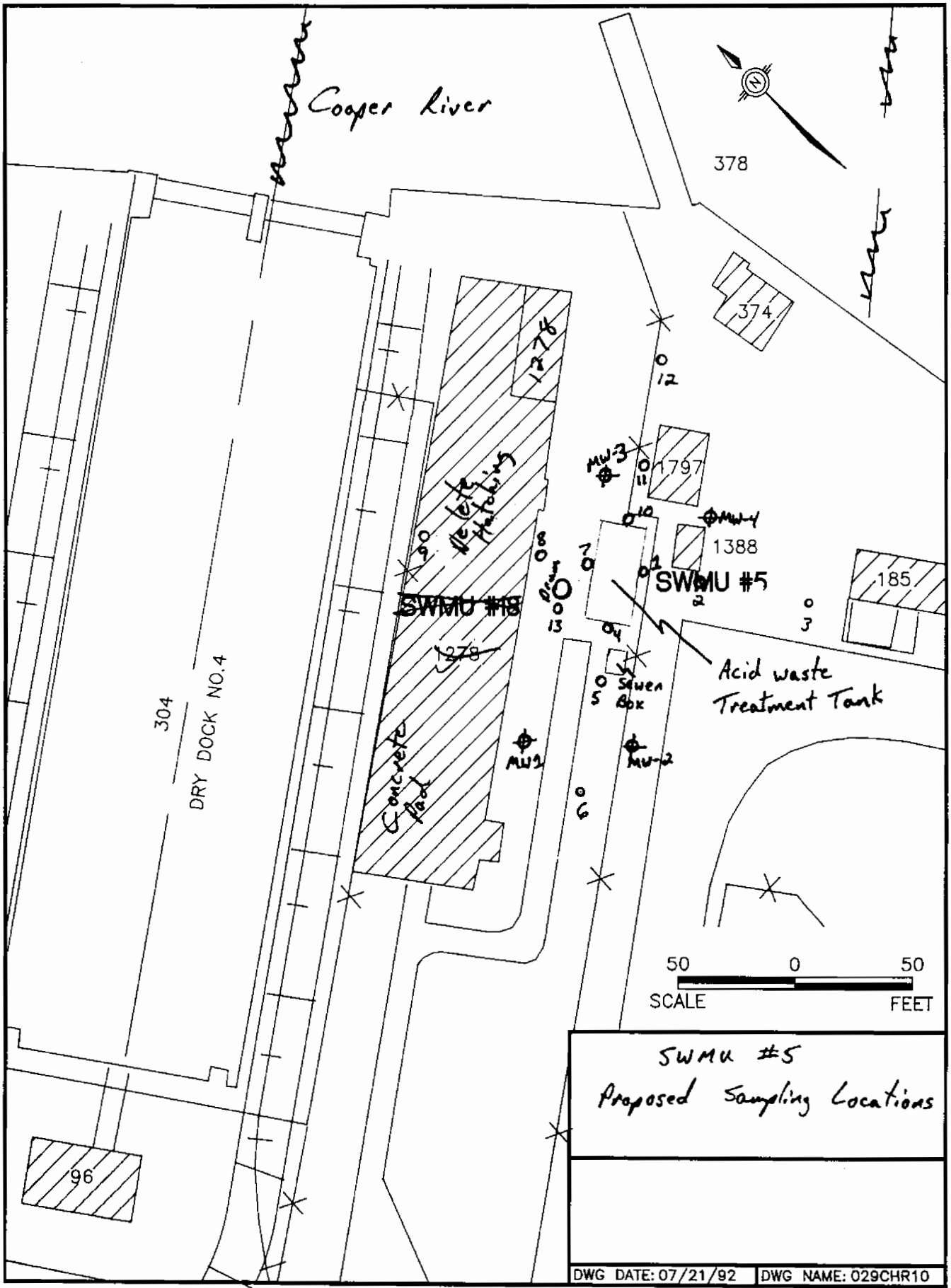
58+

(5 sed) 86

TABLE 2-1
SOLID WASTE MANAGEMENT UNIT GROUPS

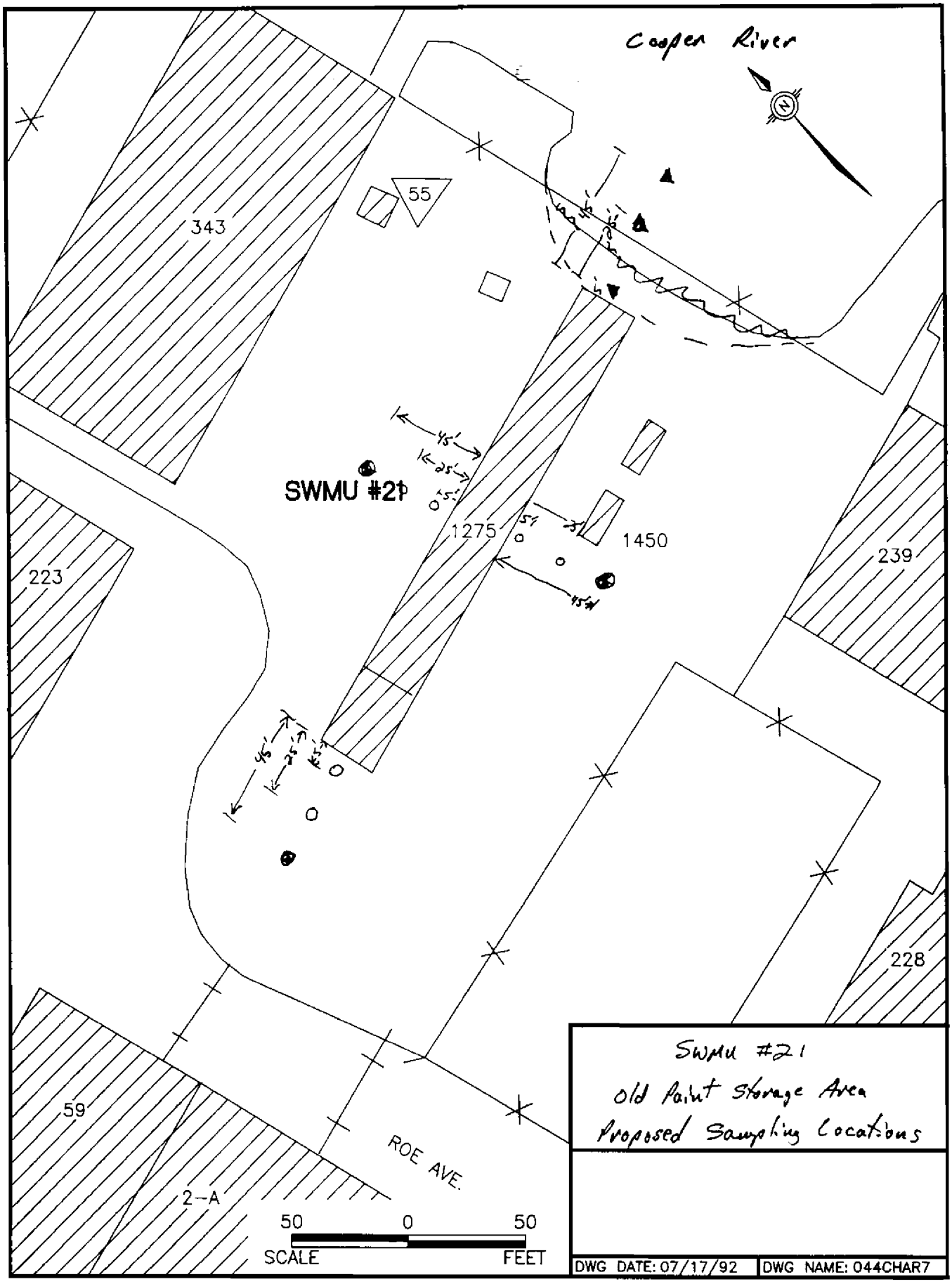
Group #	SWMU #	Description
VI	SWMU #30	Satellite Accumulation Area, Building 13*
	SWMU #31	Waste Paint Storage Area, Dry Dock No. 5
	SWMU #32	Waste Paint Storage Area, Building 195
	SWMU #33	Waste Paint Storage Area, West End, Dry Dock No.2

* SWMUs which are still in use.



◆ Proposed Monitoring Well Locations

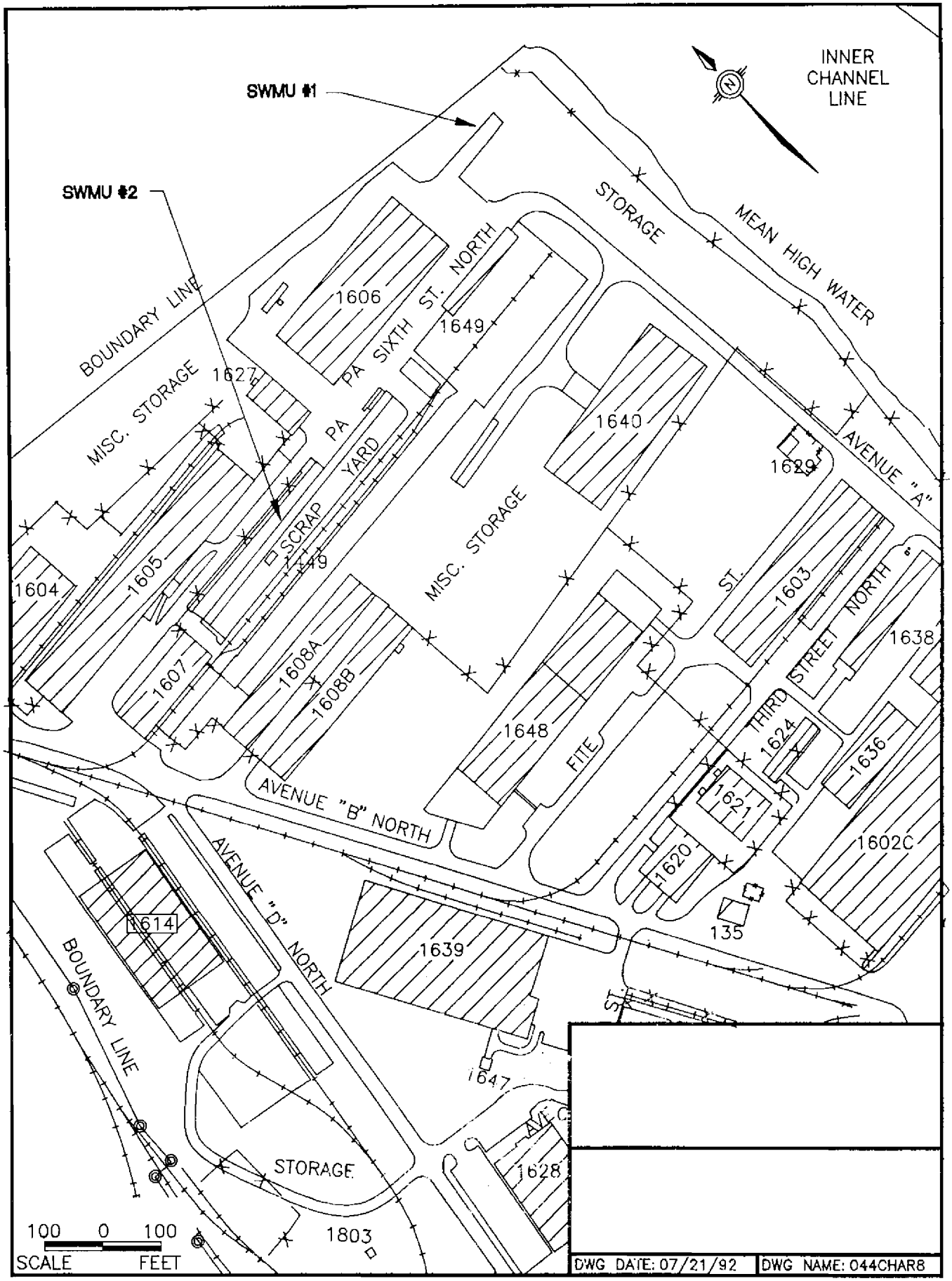
o Proposed Soil Sampling Locations

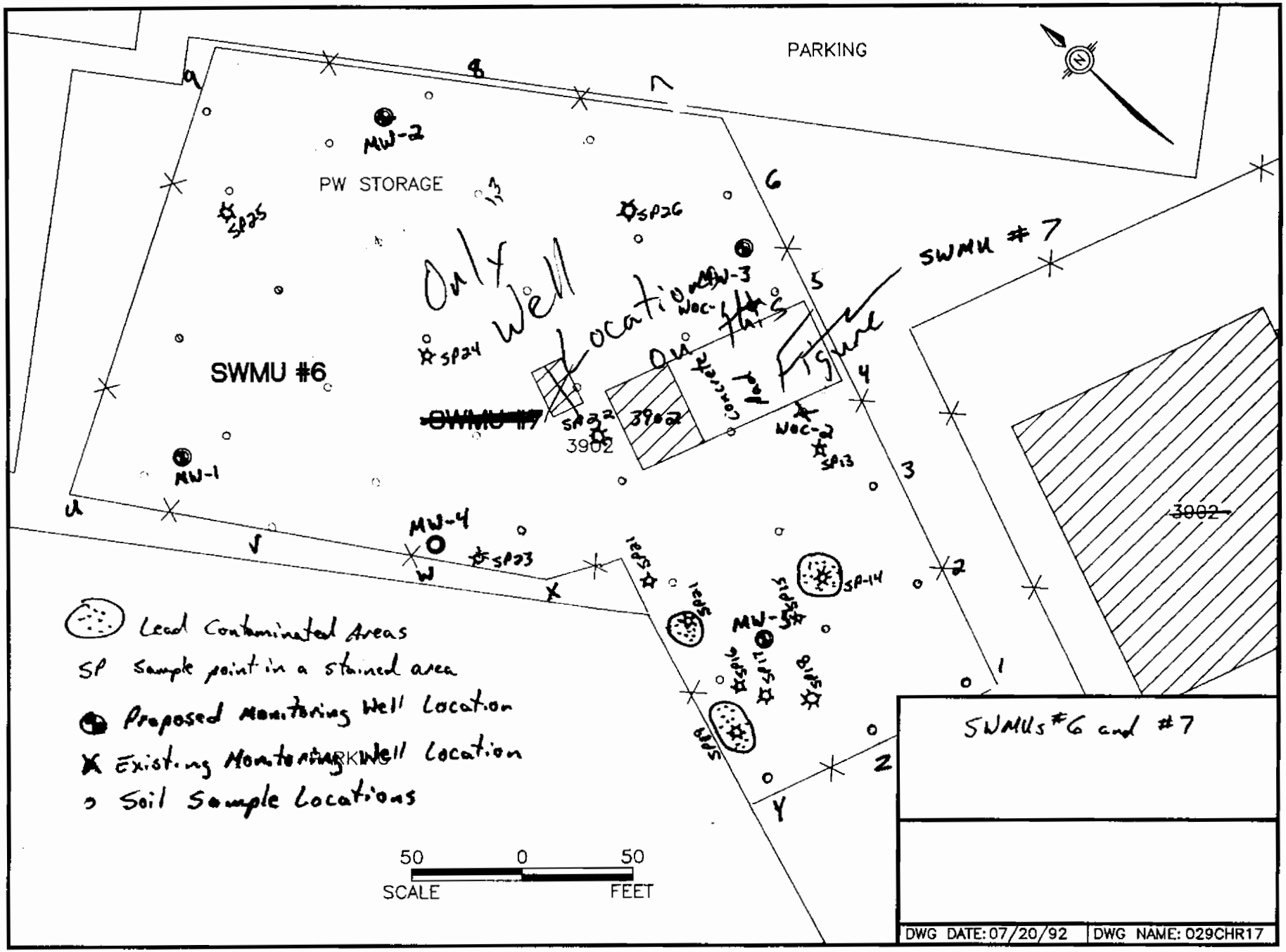


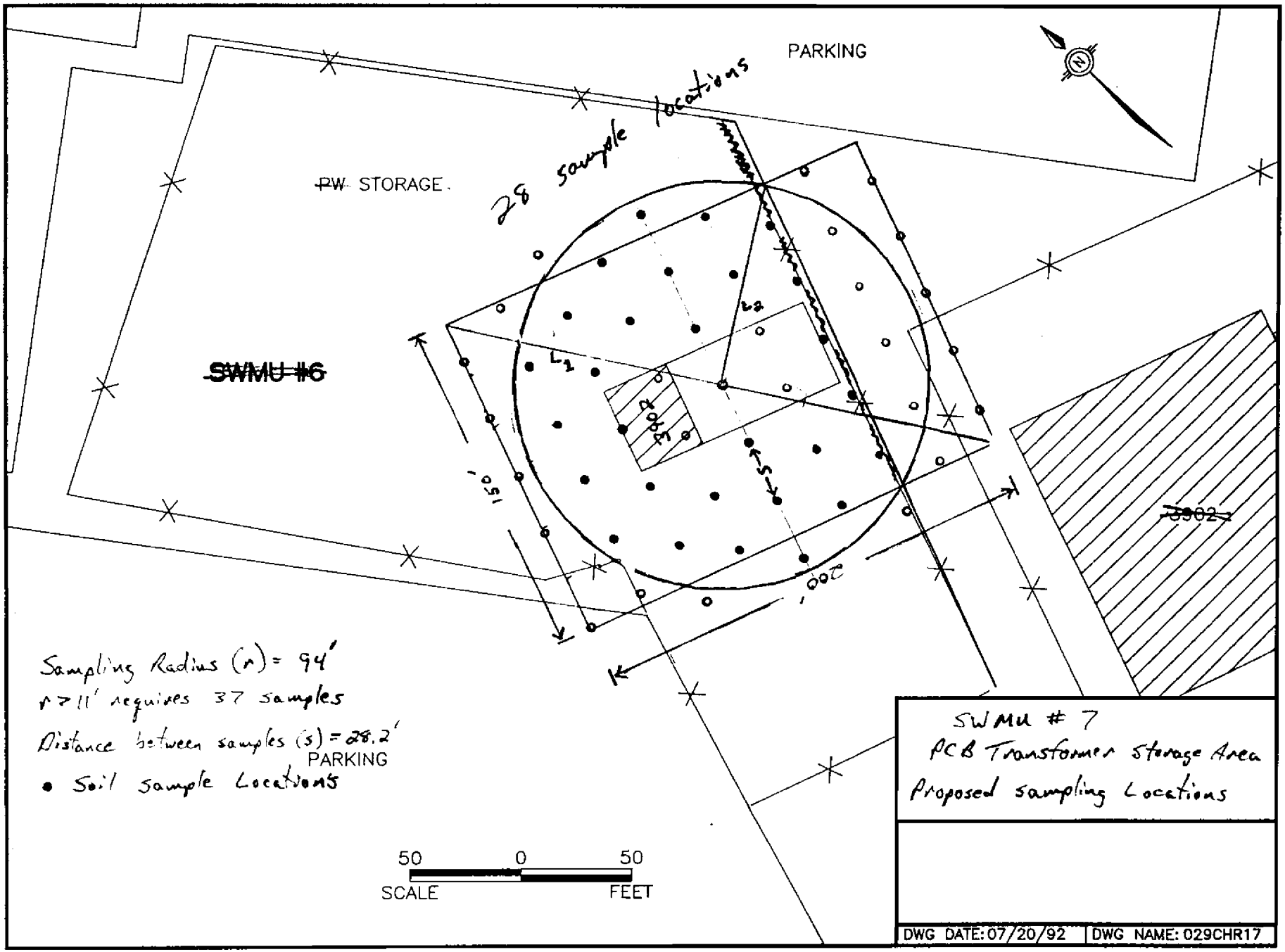
o Proposed Soil Sampling Location

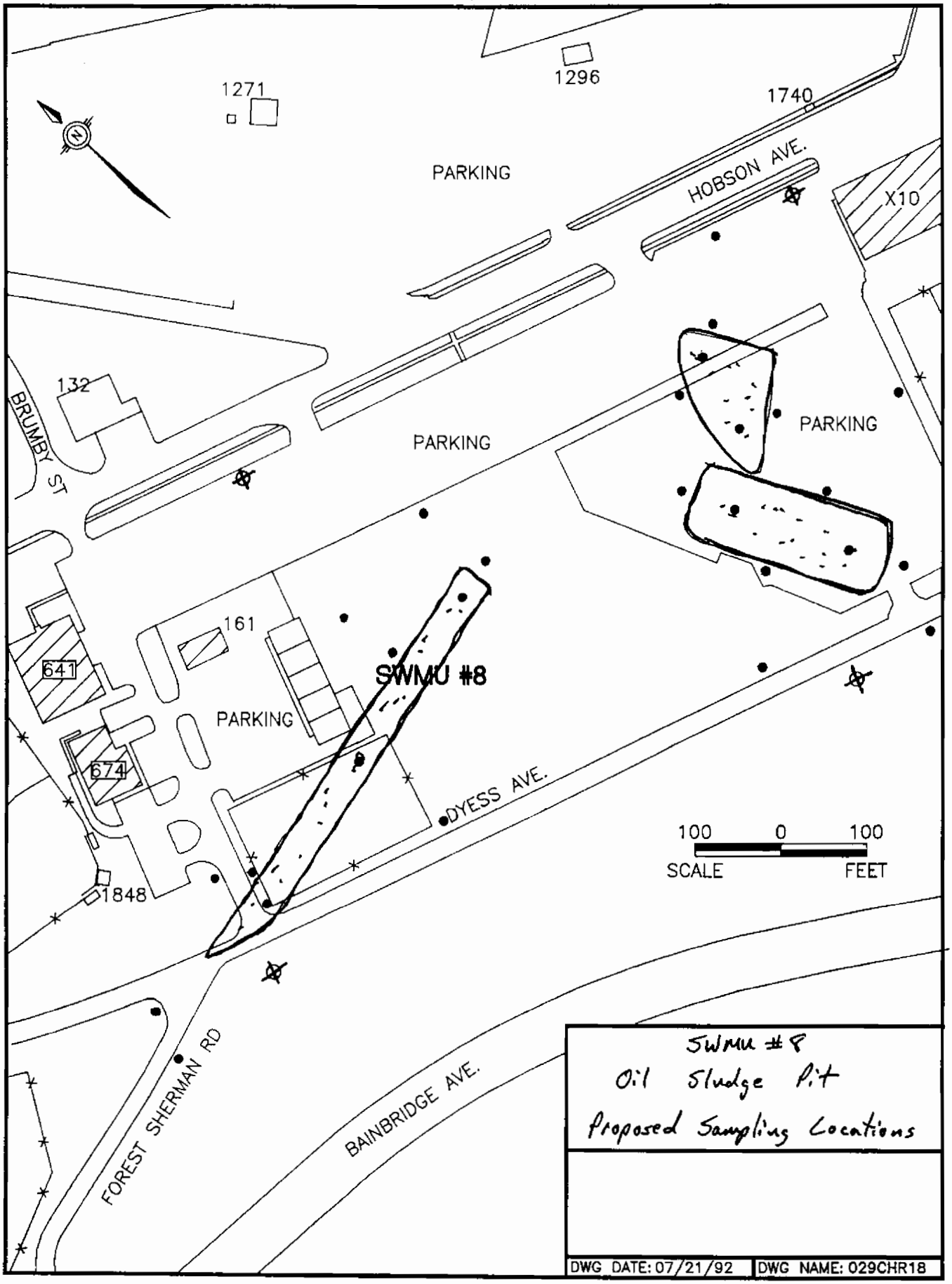
⊕ Proposed Monitoring Well Location

▲ Proposed Sediment Sample Location


SWMU #1
SWMU #2
INNER CHANNEL LINE
STORAGE
MEAN HIGH WATER
BOUNDARY LINE
MISC. STORAGE
1627
1606
PA SIXTH ST. NORTH
1649
PA SCRAP YARD
1640
1629
AVENUE "A"
1604
1605
1607
1608A
1608B
MISC. STORAGE
ST.
1603
STREET NORTH
1638
THIRD
1624
1636
1648
FITE
1621
1620
1602C
AVENUE "B" NORTH
AVENUE "D" NORTH
1614
1639
135
BOUNDARY LINE
1647
AVE C
1628
STORAGE
1803
100 0 100
SCALE FEET
DWG DATE: 07/21/92
DWG NAME: 044CHAR8


PARKING
PW STORAGE
SWMU #6
SWMU #7
Only Well Location that is Left
Old Concrete Pad
3902
3902
MW-1
MW-2
MW-3
MW-4
WOC-1
WOC-2
SP23
SP24
SP25
SP26
SP-14
Lead Contaminated Areas
SP Sample point in a stained area
Proposed Monitoring Well Location
Existing Monitoring Well Location
Soil Sample Locations
50 0 50
SCALE FEET
SWMUs #6 and #7
DWG DATE: 07/20/92
DWG NAME: 029CHR17


PARKING
~~PW~~ STORAGE
28 sample locations
~~SWMU #6~~
L1
L2
150'
200'
S
~~3502~~
Sampling Radius (r) = 94'
r > 11' requires 37 samples
Distance between samples (s) = 28.2'
PARKING
• Soil sample Locations
50 0 50
SCALE FEET
SWMU # 7
PCB Transformer Storage Area
Proposed sampling Locations
DWG DATE: 07/20/92
DWG NAME: 029CHR17



Oil Sludge Pit

• Soil Boring Location

⊕ Monitoring Well Location

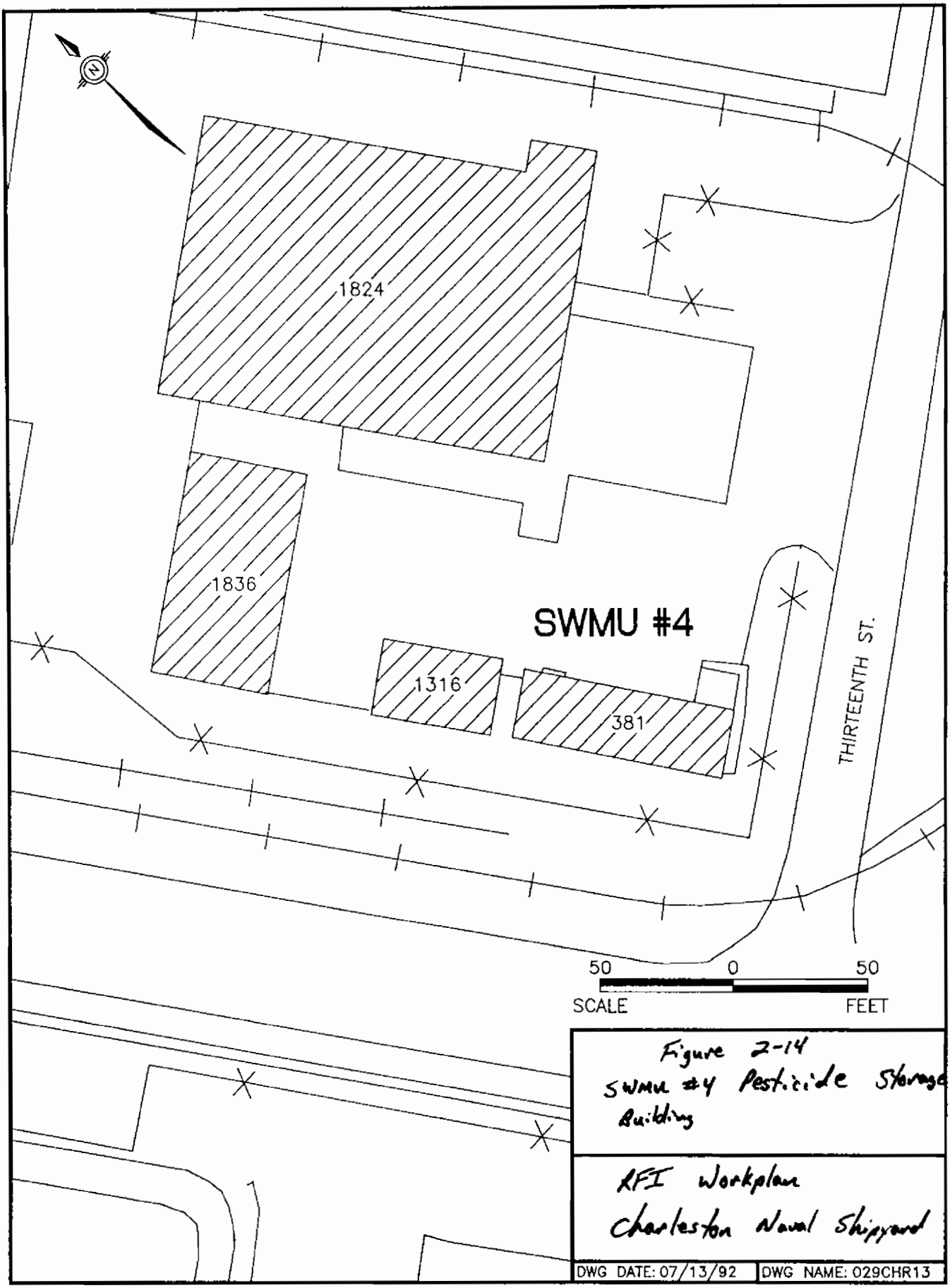
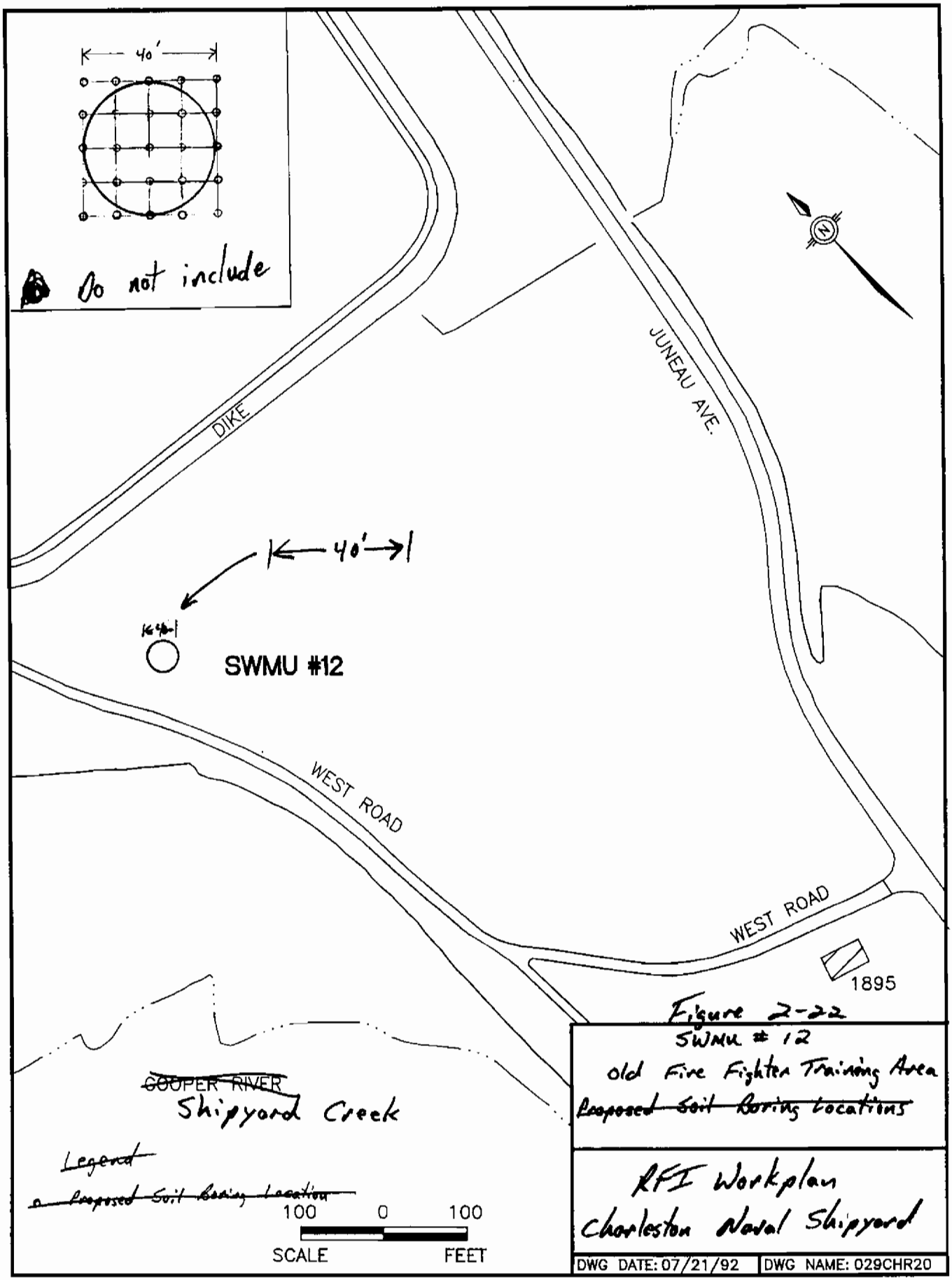
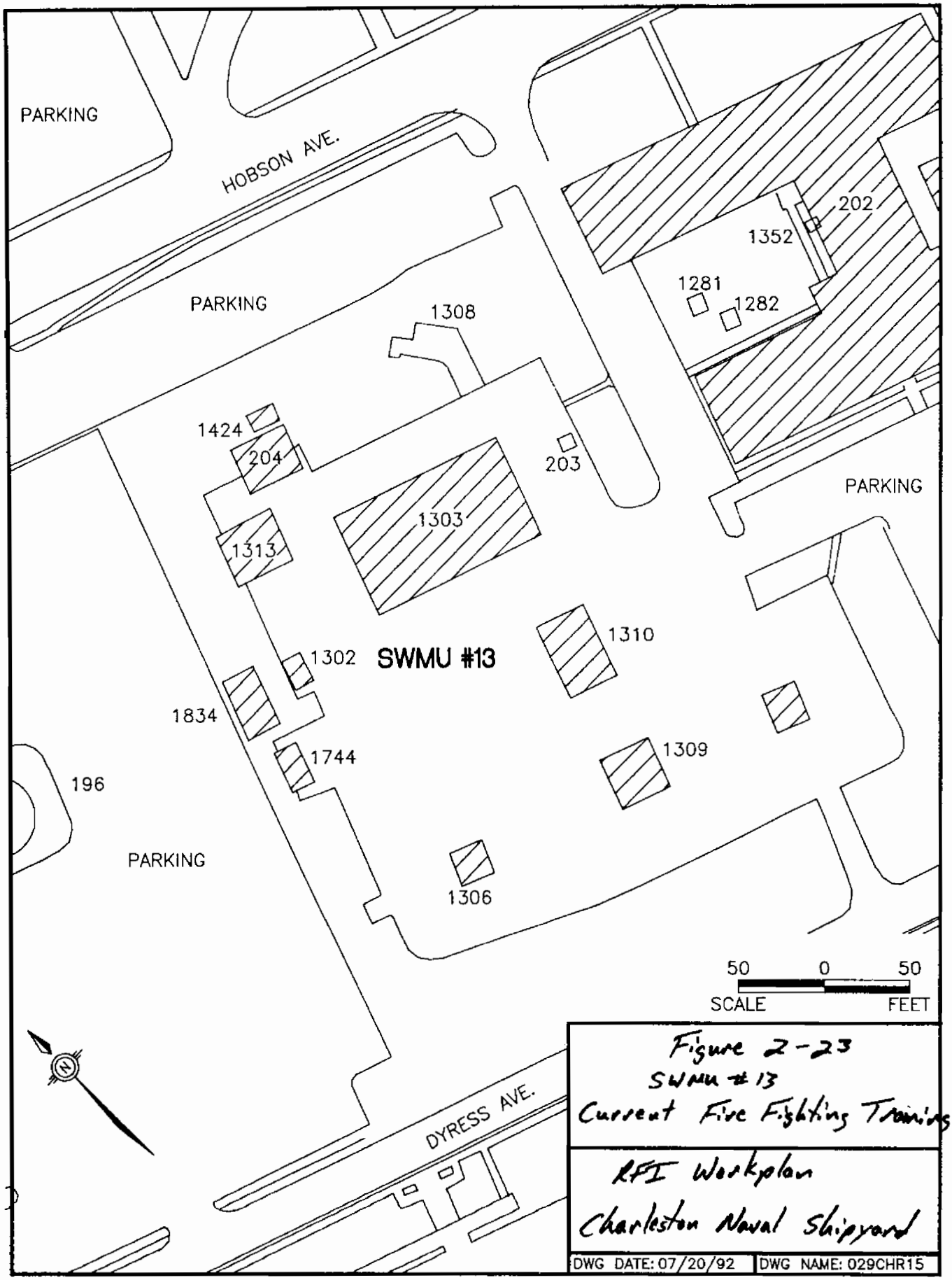


Figure 2-14
SWMU #4 Pesticide Storage Building

RFI Workplan
Charleston Naval Shipyard

DWG DATE: 07/13/92 | DWG NAME: 029CHR13


40'
Do not include
DIKE
JUNEAU AVE.
40'
SWMU #12
WEST ROAD
WEST ROAD
1895
COOPER RIVER
Shipyard Creek
Legend
Proposed Soil Boring Location
100 0 100
SCALE FEET
Figure 2-22
SWMU # 12
Old Fire Fighter Training Area
Proposed Soil Boring Locations
RFI Workplan
Charleston Naval Shipyard
DWG DATE: 07/21/92
DWG NAME: 029CHR20


PARKING
HOBSON AVE.
PARKING
1308
202
1352
1281
1282
1424
204
203
PARKING
1303
1313
1310
1302
SWMU #13
1834
1744
1309
196
PARKING
1306
50 0 50
SCALE FEET
DYRESS AVE.
Figure 2-23
SWMU #13
Current Fire Fighting Training Are
RFI Workplan
Charleston Naval Shipyard
DWG DATE: 07/20/92
DWG NAME: 029CHR15

COMMENTS ON DRAFT FINAL RFI WORKPLAN

The following are in addition to those discussed earlier today (8/11/92).

1. Include end labels on binders.

2. Pg. 3-3, Constant Rate Pump Test: The following is unclear; "...,the pumping duration is would be a minimum..."

3. Pg. 3-24, Section 3.13.2: Should RCRA metals be included in the analysis?

4. SWMU 9: In the appropriate location, state that all test trench material will be returned to the trench.

5. Pg. 3-45, Section 3.22.2: Figures 3-14/14A do not show the location of the "Ten additional sample locations.." (exterior) discussed here.

6. Pg. 3-55: "3.25.3" should be 3.27.3

7. Pg. 3-58: Correct the location of "3.28.2 Groundwater Sampling" on the page.

8. Pg. 3-60: Correct the location of "3.30 SWMU #34,.....,SWMU #35,...." on the page.

9. Pg. 4-2, first bullet: Should be "Columbia, South Carolina."

10. Pg. 4-17, Section 4.6.4: State the location of the attached literature.

11. Pg. 4-18: - Adjust the tab for 2 Methylnaphathalene 5.5
- last line: include the reference number

12. Pg. 6-1, second paragraph: This paragraph is unclear. Also, delete "(Therefore,.....interim corrective measures.)"

1st paragraph ... outlined in section 3.1

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 2
To TODD HAUERKOST	From TODD DANIELS
Co. ENSAFE	Co. SOUTH DIV
Dept.	Phone # (803) 743-0326
Fax # (901) 372-2454	Fax #

11 Aug 92

COMMENTS ON DRAFT FINAL OF RFI WORKPLAN

1. Volume I, page 2-85, top paragraph-Omit "Additional training and inspections are required for the areas in violation." This is no longer the case.

2. Volume I, page 2-90, last paragraph-Insert "be" between "will" and "investigated."

3. Volume I, page 3-60, top of page-Paragraph 3.30 should be separated from Paragraph 3.29.3.

4. Volume III, page 7-2, top of page-Refers to Appendix A. This is appendix A in Volume III not the Appendix A in volume II (the Appendix volume). The case on page 7-16 last paragraph which refers to Appendix B is similar.

Bill Book

BILL BOOK

COMMENTS ON DRAFT FINAL RFI WORKPLAN

The following are in addition to those discussed earlier today (8/11/92).

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- last line: include the reference number

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Post-it™ brand fax transmittal memo 7671	# of pages ▸ 2
To TODD HAVERKOST	From TODD DANIELS
Co. ENSAFE	Co. SOUTHDIV
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Bill Book

BILL BOOK

EnSafe
Environmental and Safety Designs, Inc.
P.O. BOX 341315, MEMPHIS, TN 38184-1315
(901) 372-7962

JOB Charleston NSY 2151-029
SHEET NO. _____ TO _____
CALCULATED BY _____ DATE 8/11/92
CHECKED BY _____ DATE _____
SCALE _____

Health & Safety Plan Comments

Comment 1 Section 7.1 Applicability

Response — The "Hold From Harm" Statement Will Be Removed From This And Future Plans.

Comment 2 Section 7.2.1 Work Areas - Support Zone

Response — The Support Area Will Be Equipped With An Appropriate First-Aid Station Which Includes A First-Aid Kit, An Emergency Eye Wash Facility, And A Mobile Telephone For Contacting Emergency Personnel.

The H&S Plan Has Been Changed Accordingly.

Comment 3 — Table 7-2 Exposure Guidelines For Expected Site Chemical Hazards.

The H&S Plan Has Been Changed Accordingly. However, Some Information Is Conflicting Among Different References (i.e., Flammability Ranges). Therefore, The Information Listed On The Provided Chemtox® MSDS Will Appear On Table 7-2.

08/11/92 08:37 ☎803 743 0563 SOUTH NAVFAC 001

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 2

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TODD HAVERKOST	TODD DANIELS
Co. ENSAFE	Co. SOUTH DIV
Dept.	Phone # (803) 743-0326
Fax # (901) 372-2454	Fax #

DESIGN COORDINATION AND RE
SOUTHNAVFACENGCOM 11012-24 (8

JOB ORDER NUMBER -89-D-0318

COMMENTS BY CONNIE MERTINE | CODE 1869 | PHONE 0386 | DATE 8-10-92

PROJECT TITLE AND LOCATION
HASP
RFI WORK PLAN
CNSY

TYPE OF REVIEW
30%
100%
FINAL
OTHER

DRG. NO. OR PAR. NO.	COMMENTS (Make general comments after specific comments)	REVIEW ACTION (& reasons where significant)
2.1	APPLICABILITY - IS THE NEXT TO LAST SENTENCE IN THE FIRST PARAGRAPH LEGAL?	
2.2.1	WORK AREAS : THE SUPPORT ZONE - What is considered an "appropriate" first-aid station?	
	~~PPE - Level of protection appropriate~~	
TABLE 1-2	EXPOSURE GUIDELINES FOR EXPECTED SITE CHEMICAL HAZARDS BENZENE - OSHA PEL = 1 ppm STEL = 5 ppm NIOSH REL = 0.1 ppm FLAMMABLE RANGE = 1.3% - 7.9% ACGIH TLV = 0.1 ppm [Changed to be implemented in 90-91] TRICHLOROETHYLENE FLAMMABLE RANGE 8% - 10.5% PCB OSHA PEL = 1 mg/m³ NIOSH REL = 0.001 mg/m³ or 0.5 mg/m³ ACGIH TLV 1 mg/m³ STEL 0.5 mg/m³ no STEL CHROMIUM VI ACGIH TLV = 0.05 mg/m³ NIOSH REL = 0.5 mg/m³ CHROMIUM II + III TLV = 0.5 mg/m³ PEL + REL = 0.5 mg/m³ CADMIUM TLV = 0.05 mg/m³ CHLOROFORM NIOSH REL - STEL = 2 ppm - no ceiling TETRACHLOROETHYLENE ACGIH TLV STEL = 200 ppm BARIUM OSHA/NIOSH = 0.5 mg/m³ ACGIH = 0.5 mg/m³ HEPTACHLOR NIOSH = 0.5 mg/m³ BISHYDROXYCOUMARIN (BHC) OR LINDANE NIOSH/OSHA/ACGIH = 0.5 mg/m³ METHYLENE CHLORIDE FLAMMABLE RANGE = 19% - 22%	

SHEET 1 OF SHEETS

DESIGN COORDINATION AND REVIEW - COMMENTS
SOUTHNAVFACENGCOM 11072-24 (8/78)

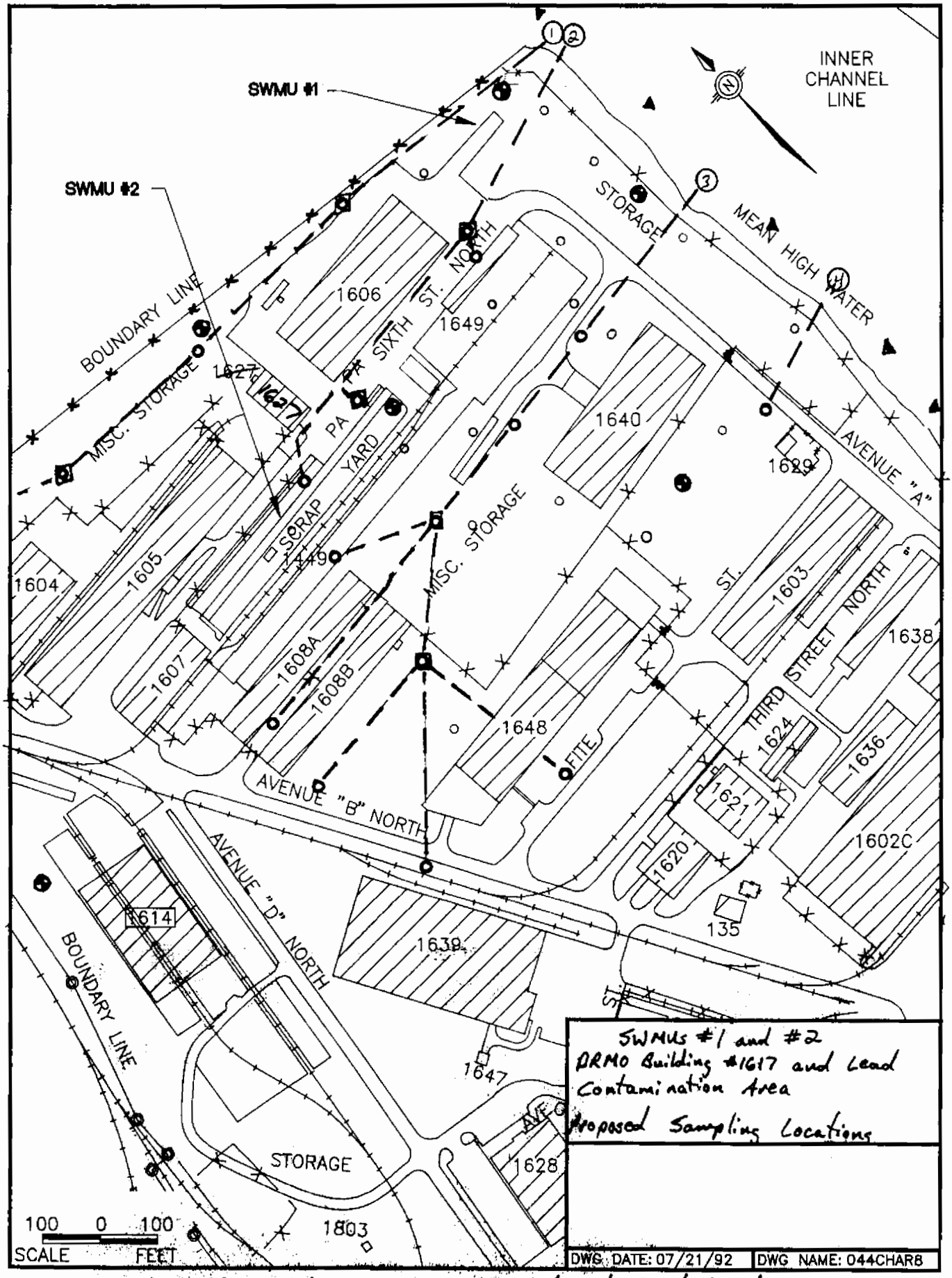
JOB ORDER NUMBER -89-D-0318

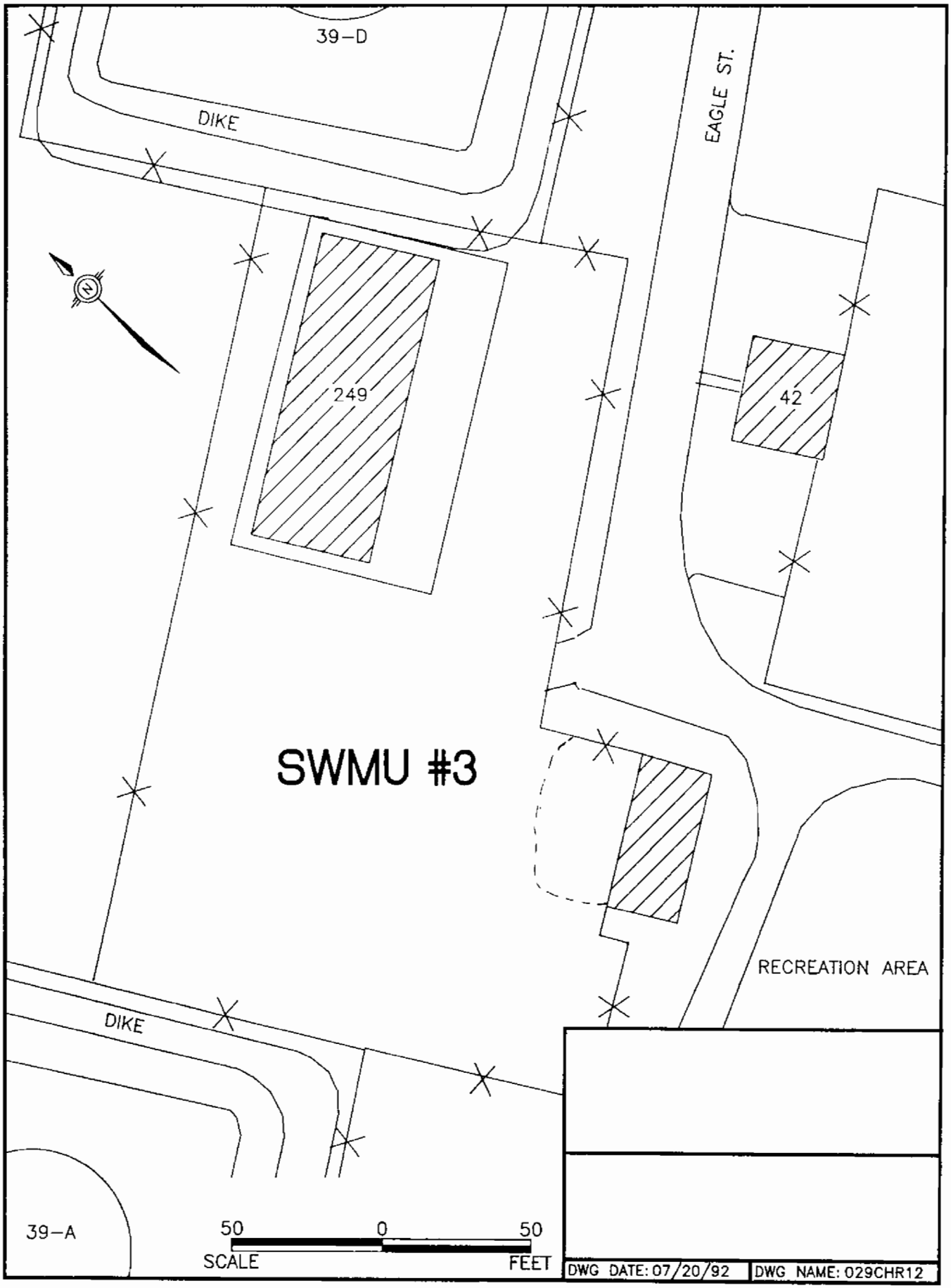
COMMENTS BY: CONNIE MERTING | CODE: 1869 | PHONE: 0386 | DATE: 8-10-92

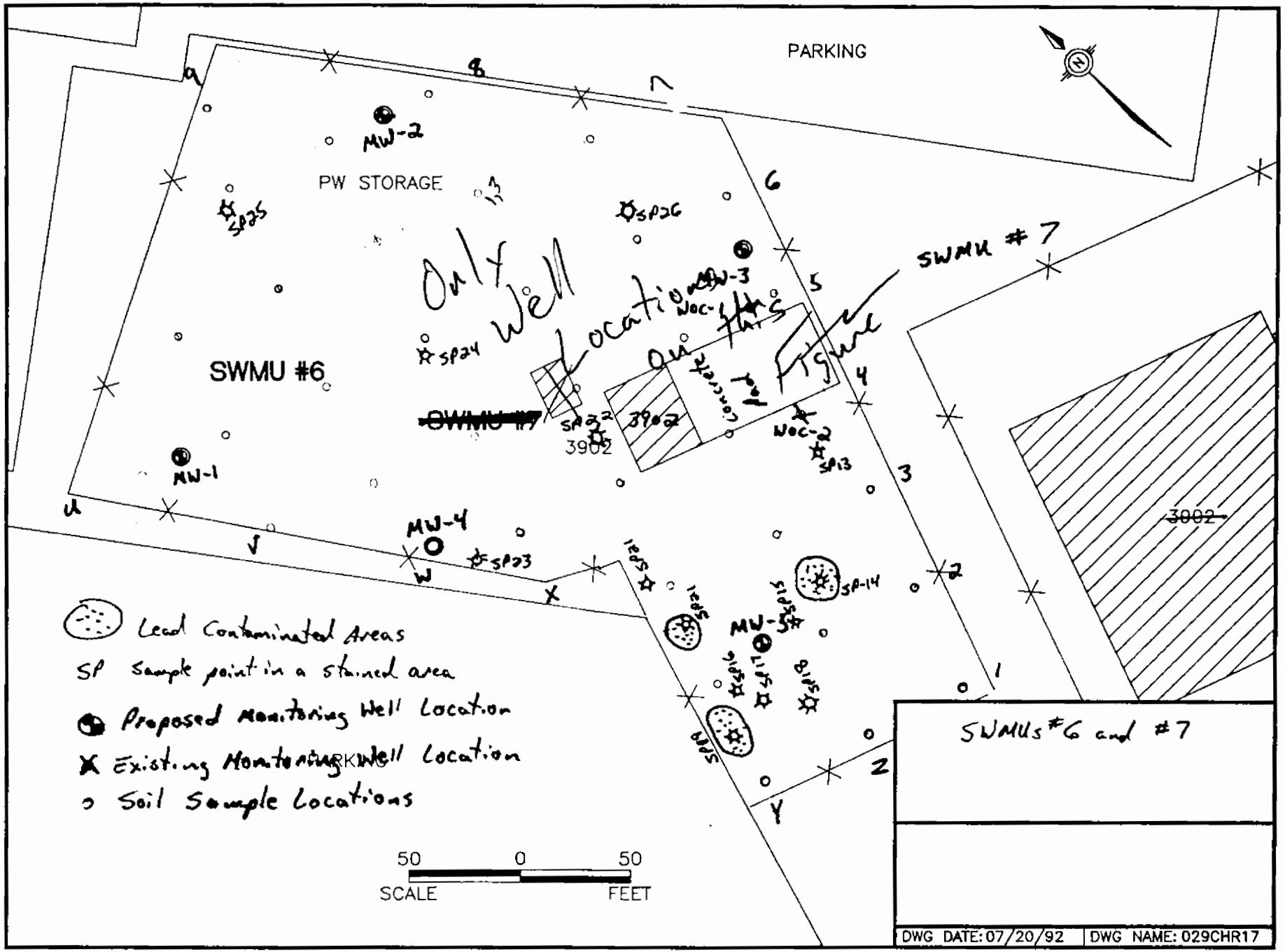
PROJECT TITLE AND LOCATION: RFI WORKPLAN, NASP, CNSY

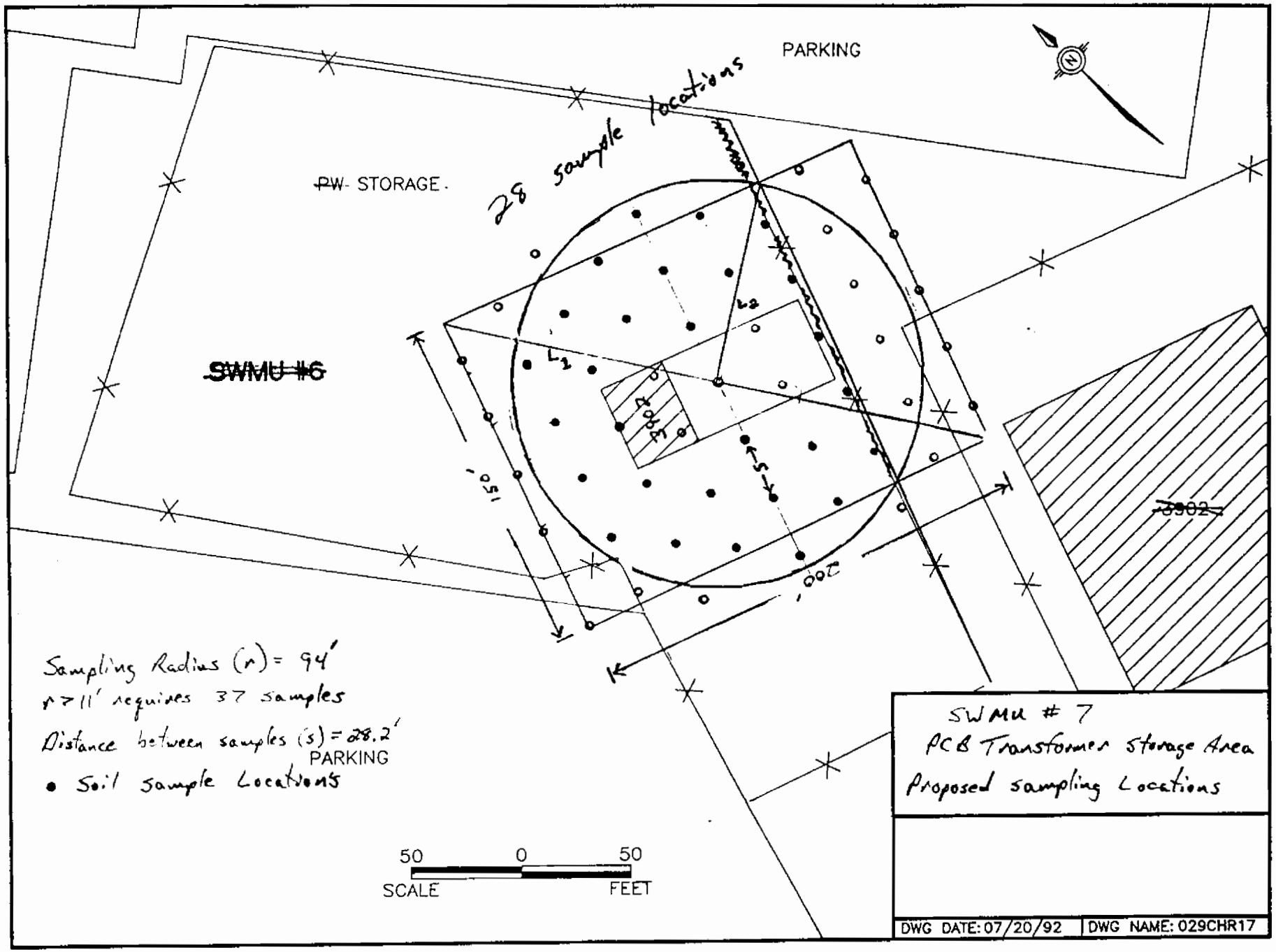
TYPE OF REVIEW: 30% | 100% | FINAL | OTHER

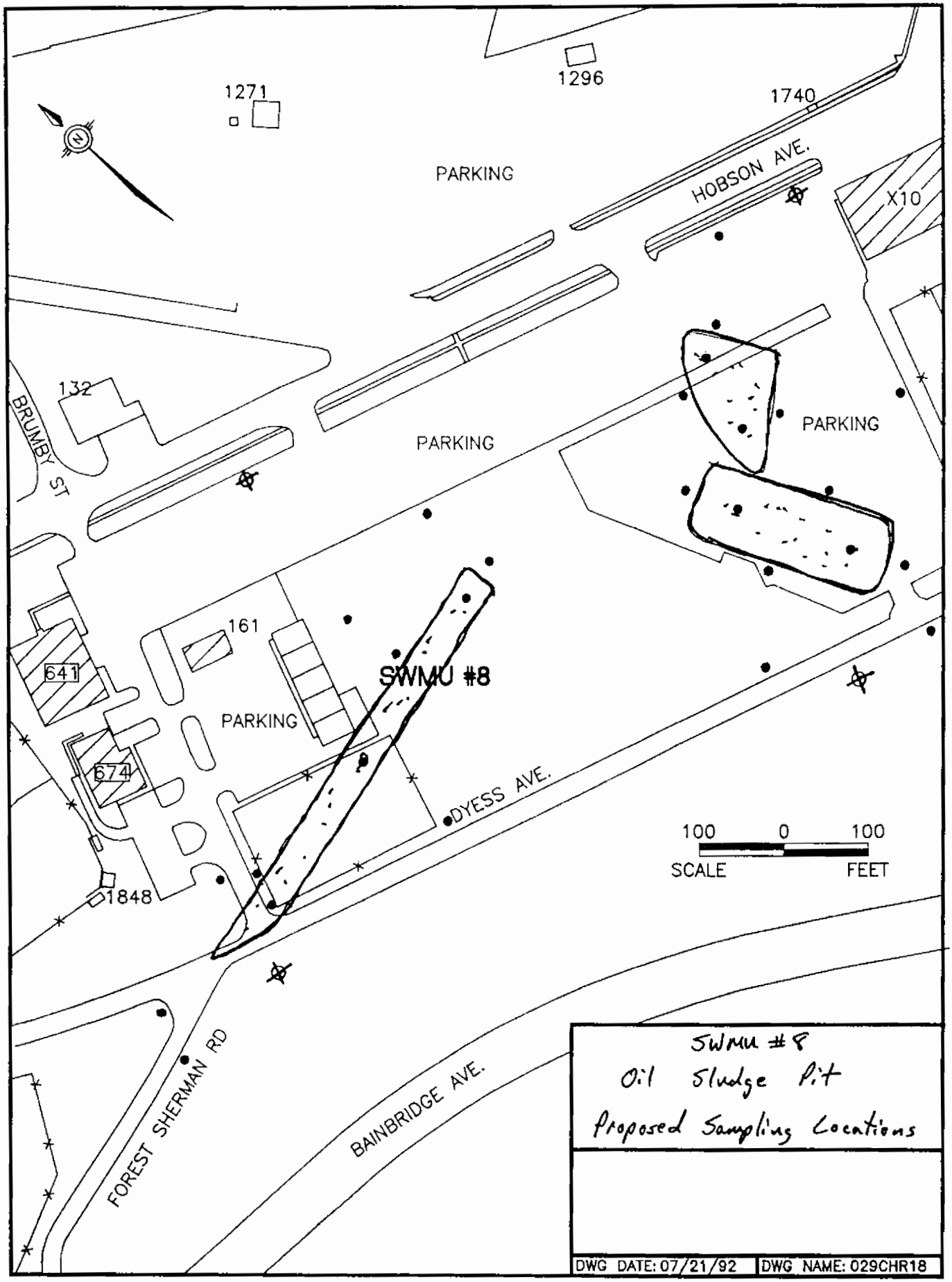
DWG. NO. OR PAR. NO.	COMMENTS (Make general comments after specific comments)	REVIEW ACTION (& reasons where significant)
TABLE 7-2 CONTINUED:		
	1,1,1-TRICHLOROETHANE OR METHYL CHLOROFORM NIOSH CEILING = 350 ppm OSHA 350 ppm STEL = 450 ppm ACGIH 350 ppm	
	COPPER DUST NIOSH = 1 mg/m³ FUME NIOSH = 0.1 mg/m³	
	FLUORIDE NIOSH/OSHA/ACGIH = 2.5 mg/m³	
	SILVER NIOSH 0.01 mg/m³	
	HYDROCHLORIC ACID NIOSH = 5 ppm Ceiling	
TABLE 7-3 - Shouldn't this ~~table~~ be different than table 7-1? Why don't you reference table 7-1 in paragraph 7.6.1 instead of creating a redundant table (7-3)?		
	APPENDIX A - It is a violation of your employee's privacy rights to include ~~their~~ lab results. The only information that is necessary for publication is whether or not they are medically qualified for the job.	
	APPENDIX D - Have you made arrangements with the Branch Clinic at the Naval Hospital to test contractor employees?	


SWMU #1
SWMU #2
INNER CHANNEL LINE
MEAN HIGH WATER
STORAGE
BOUNDARY LINE
MISC. STORAGE
SCRAP YARD
PA
SIXTH ST. NORTH
AVENUE "A"
AVENUE "B" NORTH
AVENUE "D" NORTH
THIRD STREET NORTH
1604
1605
1606
1607
1608A
1608B
1603
1636
1638
1639
1640
1648
1649
1620
1621
1624
1627
1628
1629
1602C
1614
1647
1803
135
FITE
100 0 100
SCALE FEET
SWMUs #1 and #2
DRMO Building #1617 and Lead Contamination Area
Proposed Sampling Locations
DWG DATE: 07/21/92
DWG NAME: 044CHAR8
Soil Sampling Location
Monitoring Well Location
Storm Sewer Sample Location
Sediment Sample Location
Stormwater outfall


39-D
DIKE
EAGLE ST.
249
42
SWMU #3
RECREATION AREA
DIKE
39-A
50
0
50
SCALE
FEET
DWG DATE: 07/20/92
DWG NAME: 029CHR12


PARKING
PW STORAGE
SWMU #6
SWMU #7
MW-1
MW-2
MW-3
MW-4
MW-5
SP23
SP24
SP25
SP26
SP-14
3902
Only Well Location on this Island
Lead Contaminated Areas
SP Sample point in a stained area
Proposed Monitoring Well Location
Existing Monitoring Well Location
Soil Sample Locations
50 0 50
SCALE FEET
SWMUs #6 and #7
DWG DATE: 07/20/92
DWG NAME: 029CHR17

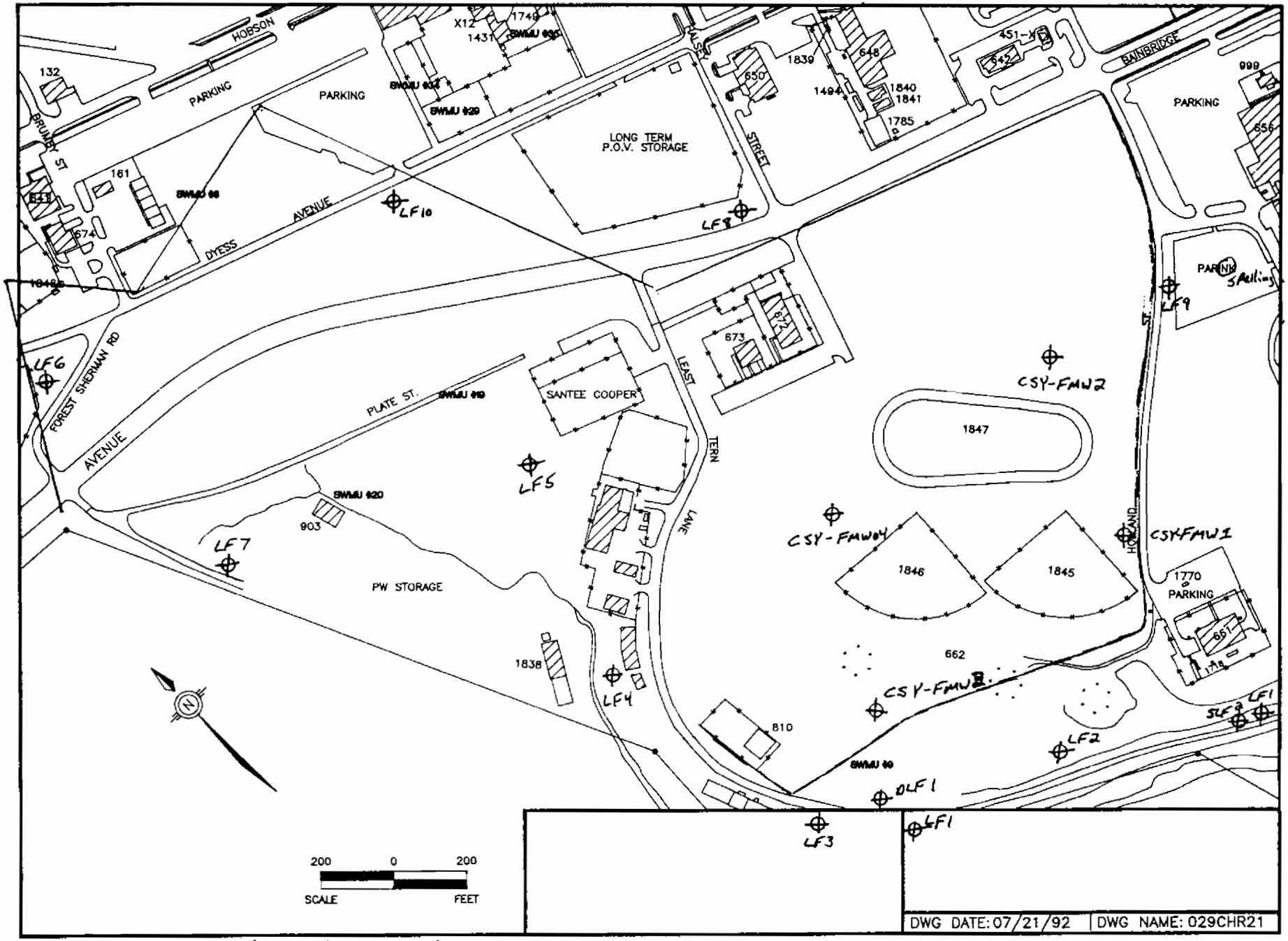

PARKING
~~RW~~ STORAGE
28 sample locations
~~SWMU #6~~
L1
L2
100 Ft
150'
150'
~~8302~~
Sampling Radius (r) = 94'
r = 11' requires 37 samples
Distance between samples (s) = 28.2'
PARKING
• Soil sample Locations
50 0 50
SCALE FEET
SWMU # 7
PCB Transformer Storage Area
Proposed sampling Locations
DWG DATE: 07/20/92
DWG NAME: 029CHR17



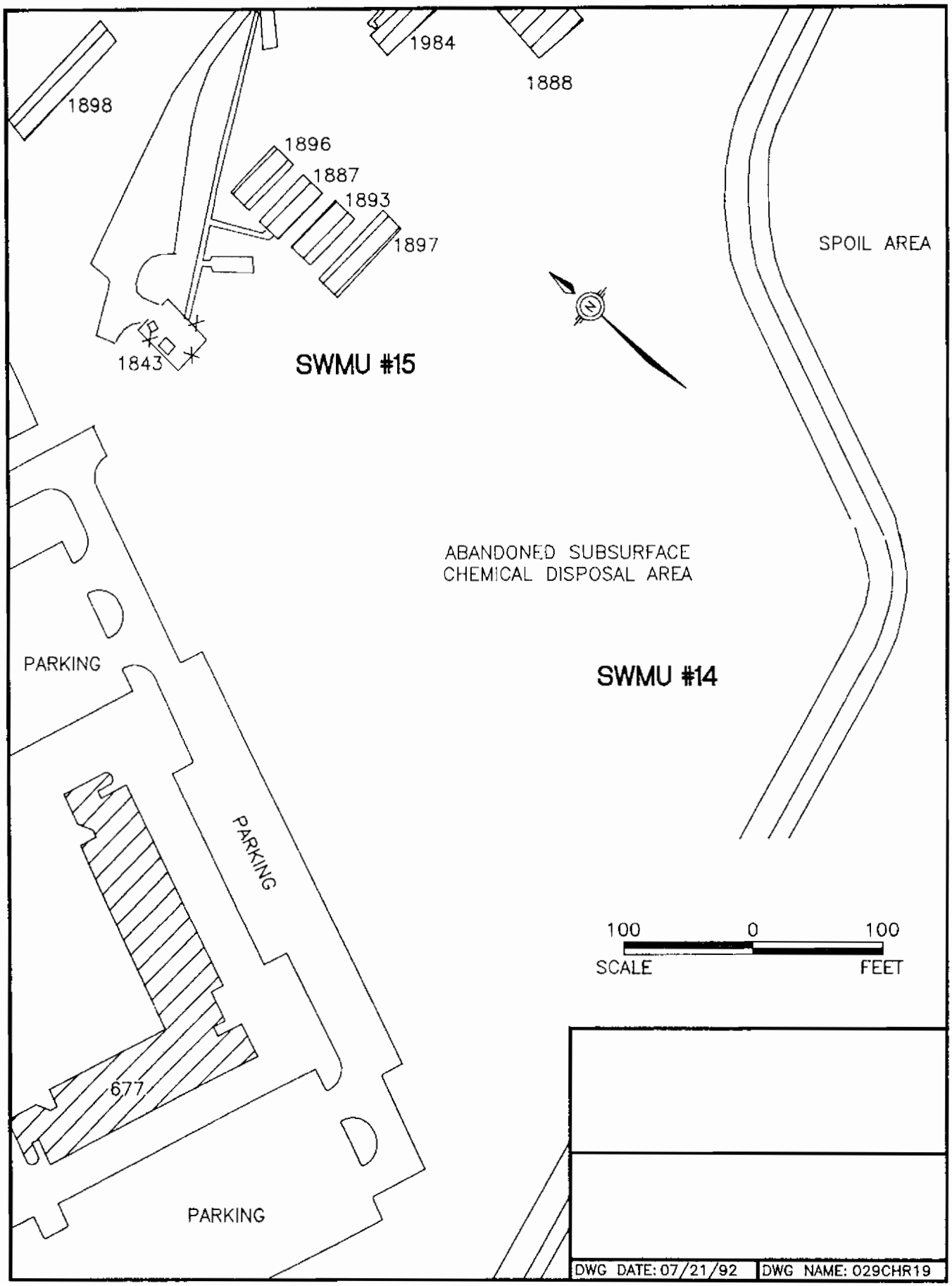
Oil Sludge Pit

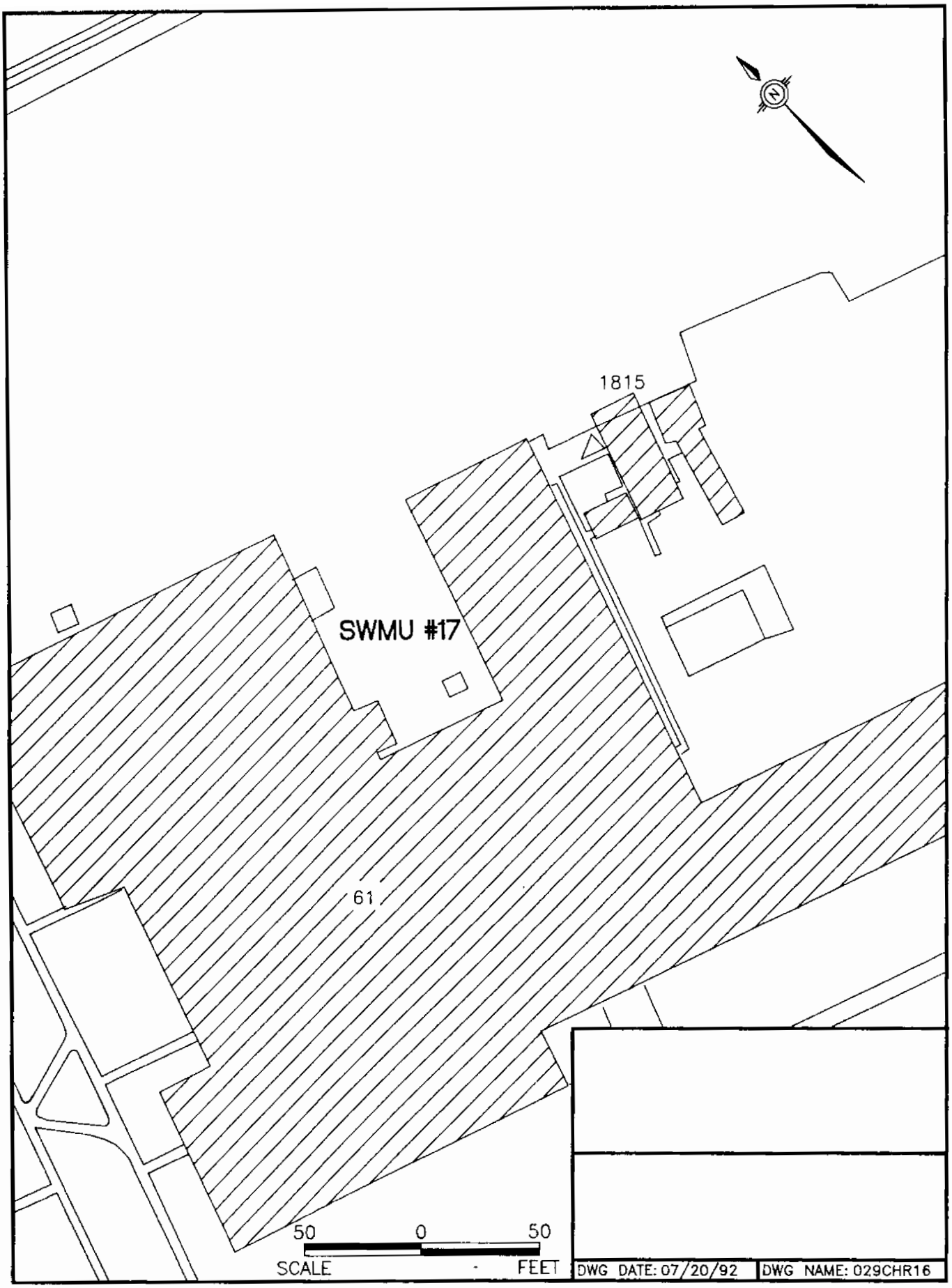
• Soil Boring Location

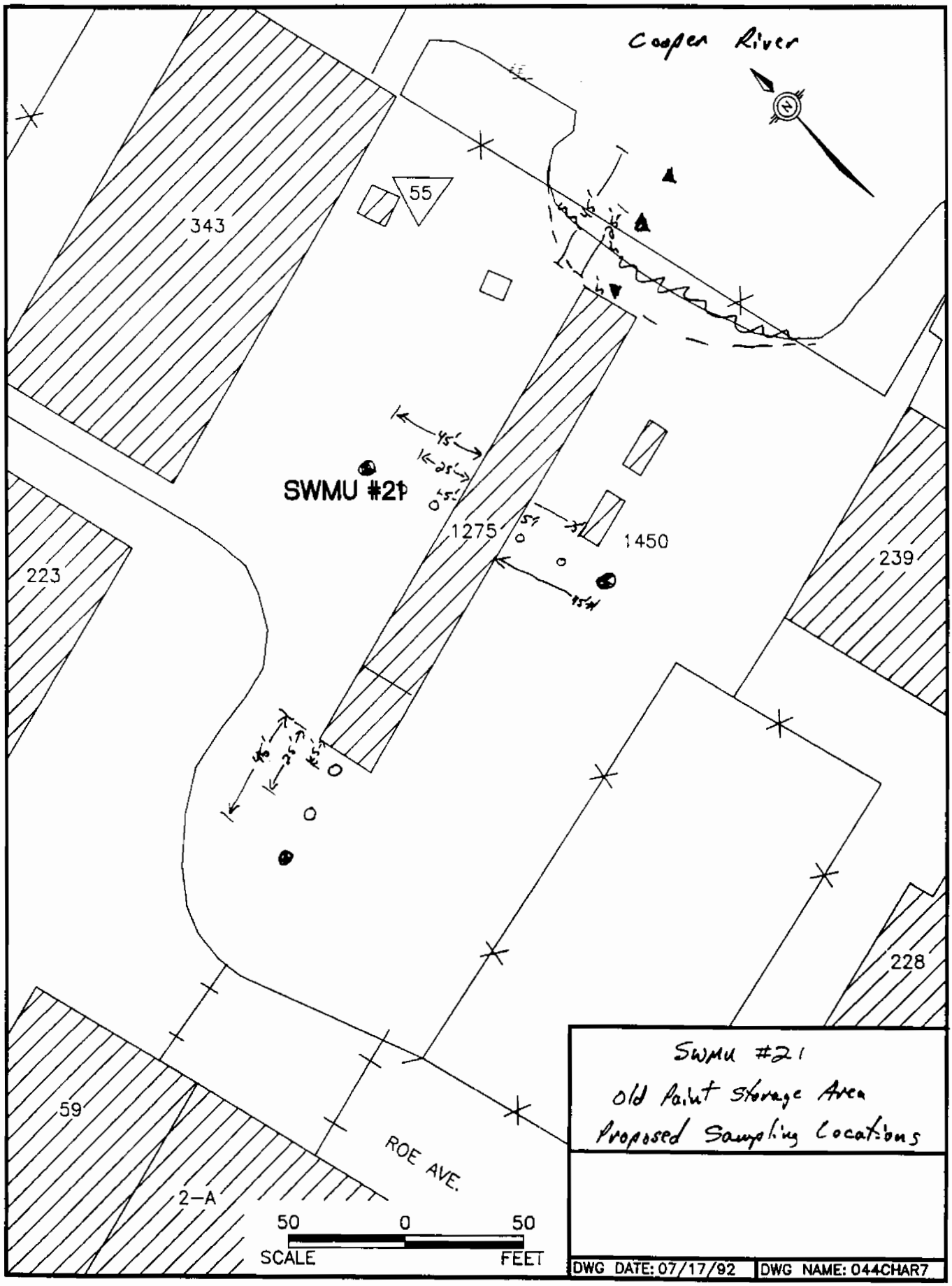
⊕ Monitoring Well Location



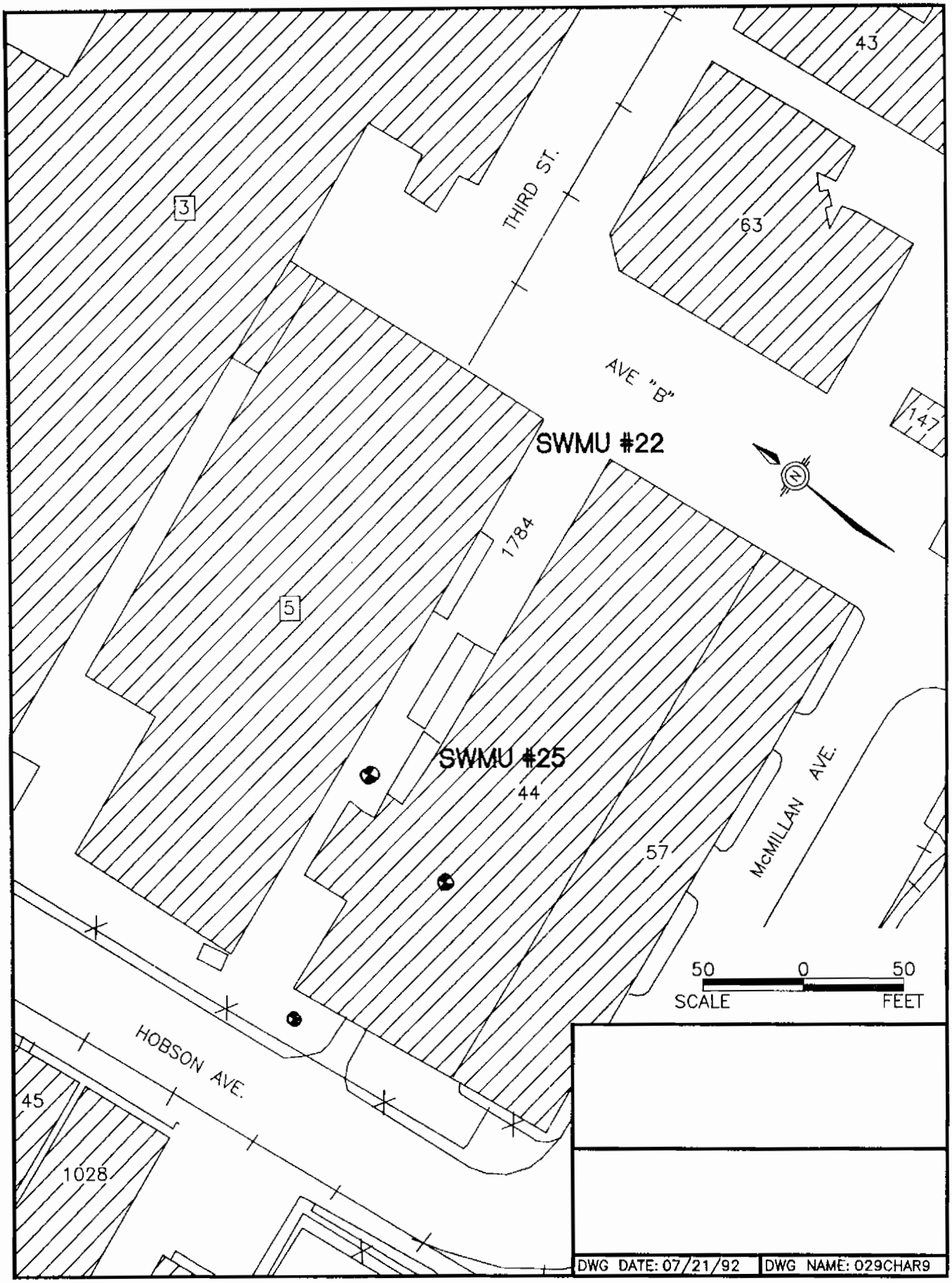
Closed Landfill Boundary

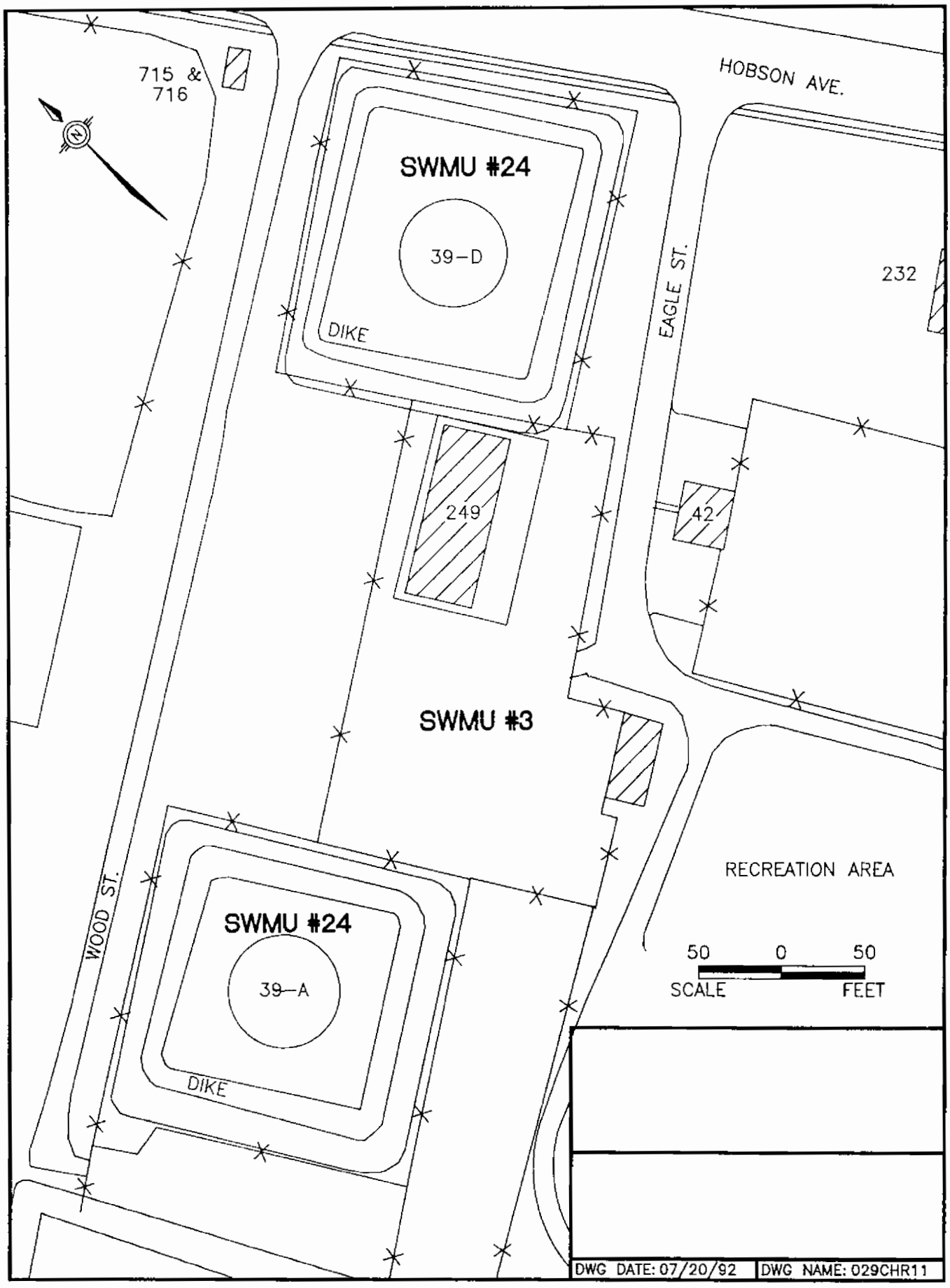

1984
1888
1898
1896
1887
1893
1897
SPOIL AREA
1843
SWMU #15
ABANDONED SUBSURFACE
CHEMICAL DISPOSAL AREA
PARKING
SWMU #14
PARKING
100 0 100
SCALE FEET
677
PARKING
DWG DATE: 07/21/92
DWG NAME: 029CHR19

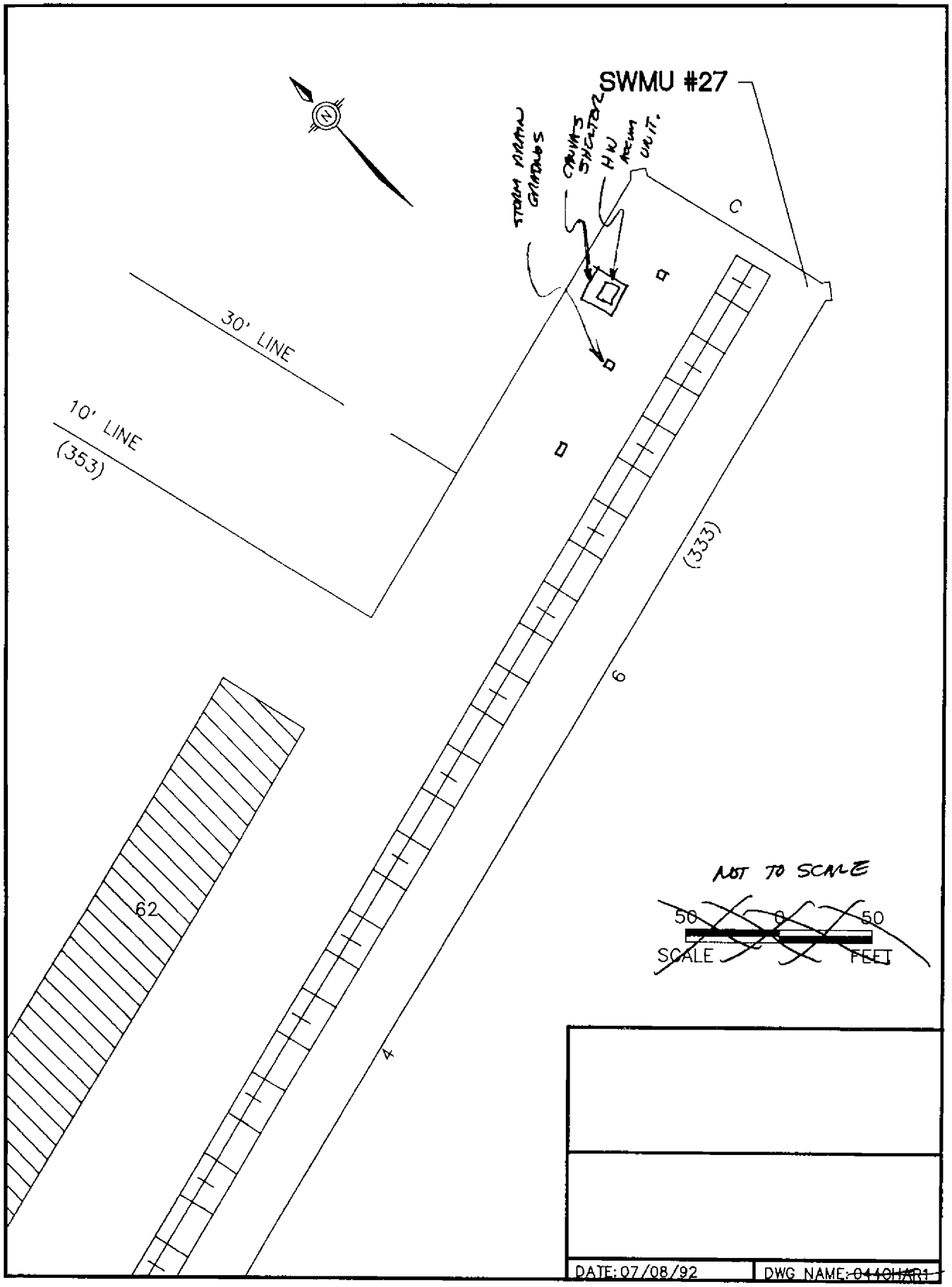

1815
SWMU #17
61
50
0
50
SCALE
FEET
DWG DATE: 07/20/92
DWG NAME: 029CHR16



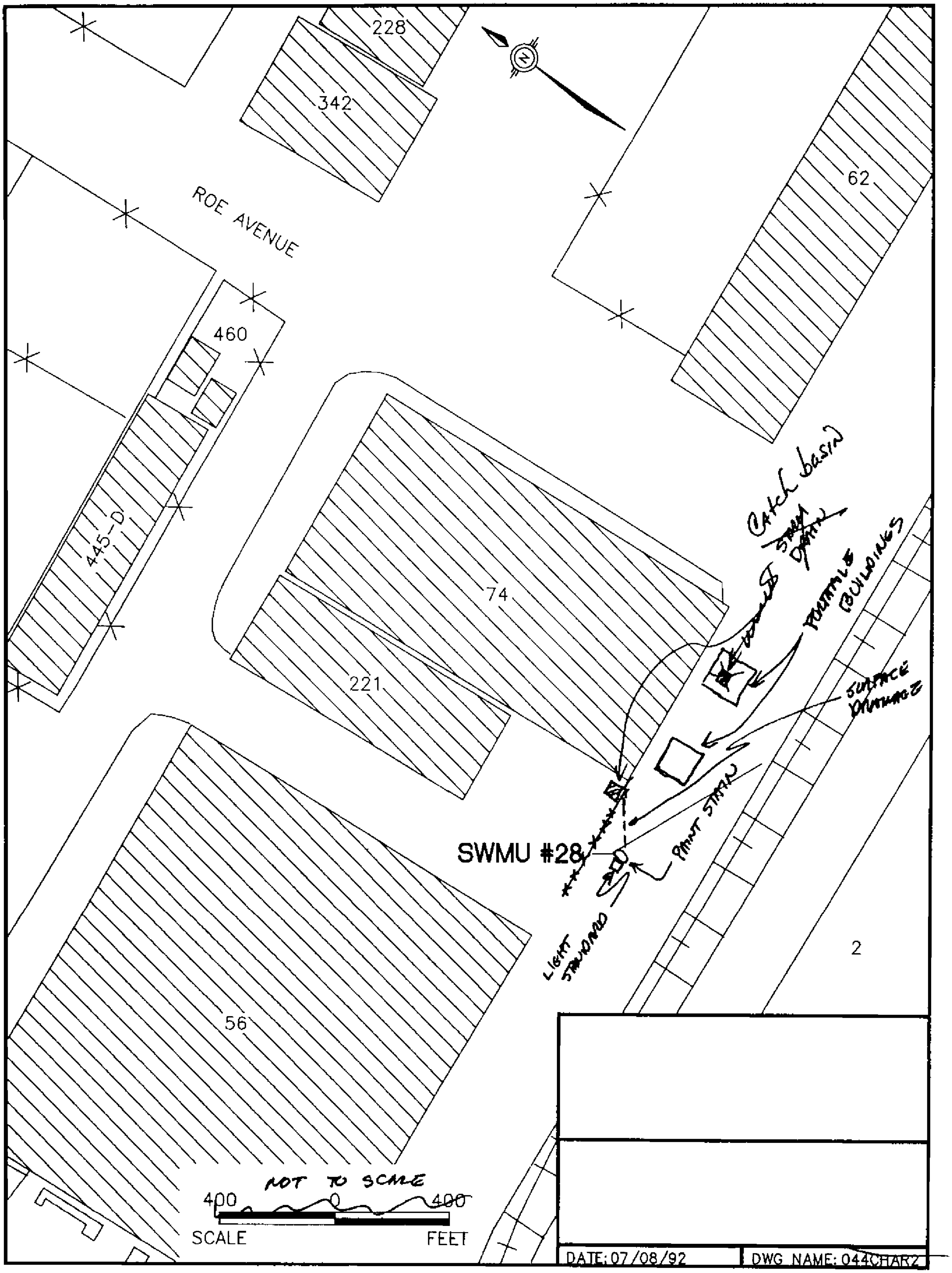
○ Proposed Soil Sampling Location
⊕ Proposed Monitoring Well Location
▲ Proposed Sediment Sample Location


43
THIRD ST.
63
3
AVE "B"
147
SWMU #22
1784
5
SWMU #25
44
57
McMILLAN AVE.
50 0 50
SCALE FEET
HOBSON AVE.
45
1028
DWG DATE: 07/21/92
DWG NAME: 029CHAR9

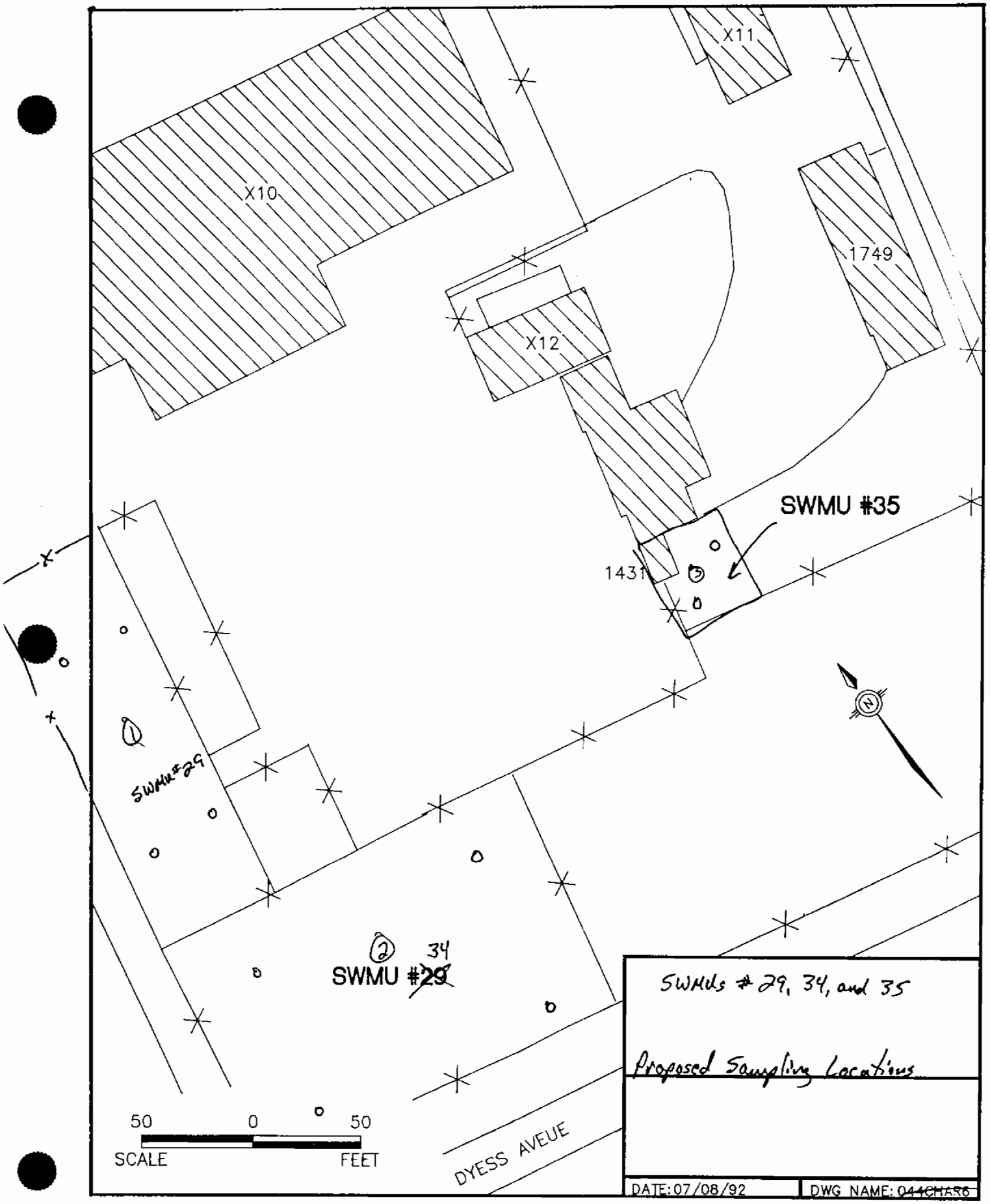

715 &
716
HOBSON AVE.
SWMU #24
39-D
DIKE
EAGLE ST.
232
249
42
SWMU #3
RECREATION AREA
WOOD ST.
SWMU #24
39-A
DIKE
50 0 50
SCALE FEET
DWG DATE: 07/20/92
DWG NAME: 029CHR11


SWMU #27
STORM DRAIN GRATES
CRAWL SPACE
H.W. HEAT UNIT
C
30' LINE
10' LINE
(353)
(333)
6
4
62
NOT TO SCALE
50
0
50
SCALE
FEET
DATE: 07/08/92
DWG NAME: 0410HAR1

029CHAR1


228
342
62
ROE AVENUE
460
445-D
74
221
56
2
SWMU #28
Catch basin
PORTABLE BUILDINGS
SURFACE DRAINAGE
PAINT STAIN
LIGHT STANDARD
NOT TO SCALE
400 0 400
SCALE FEET
DATE: 07/08/92
DWG NAME: 044CHAR2

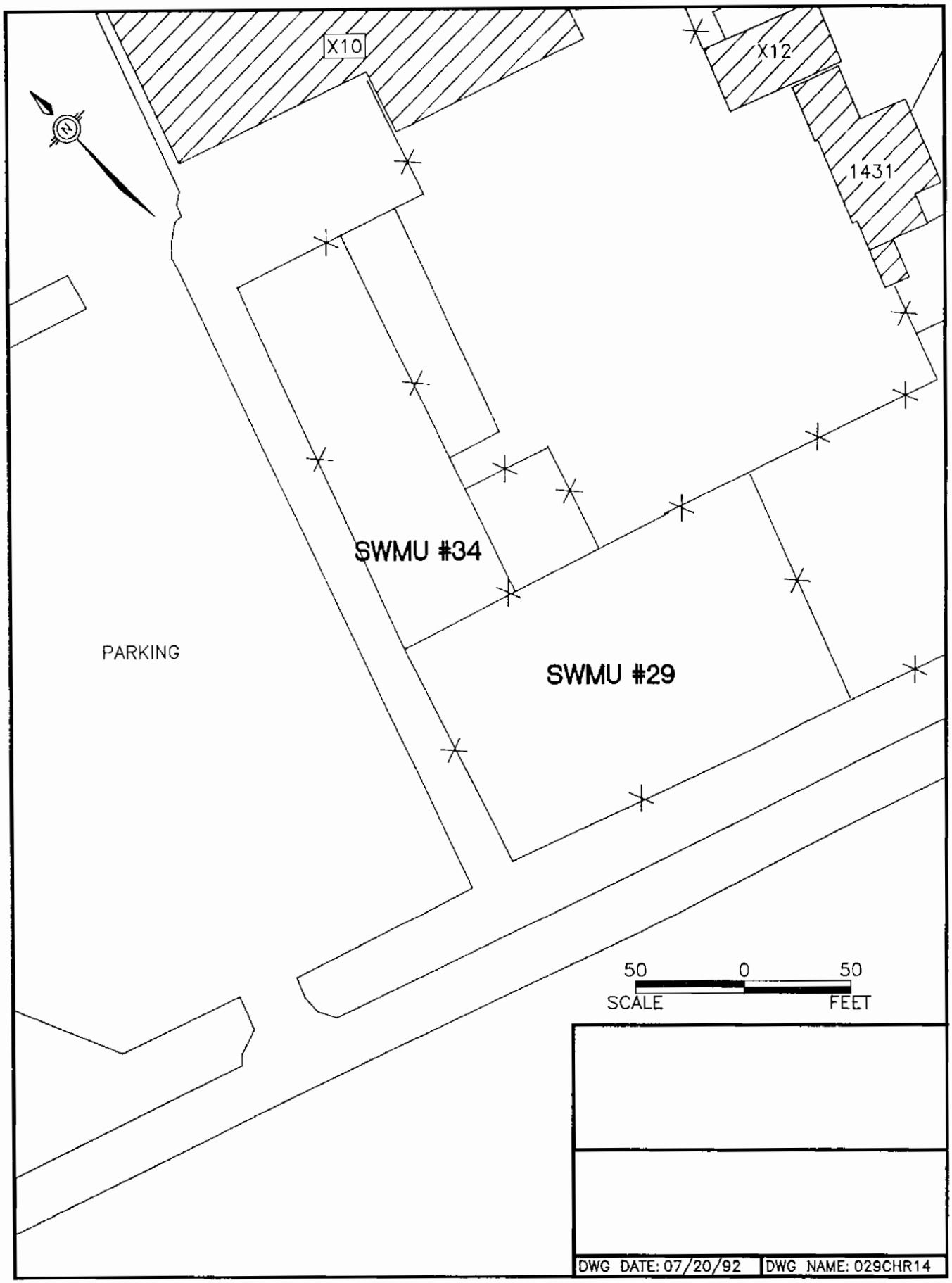
044CHAR2



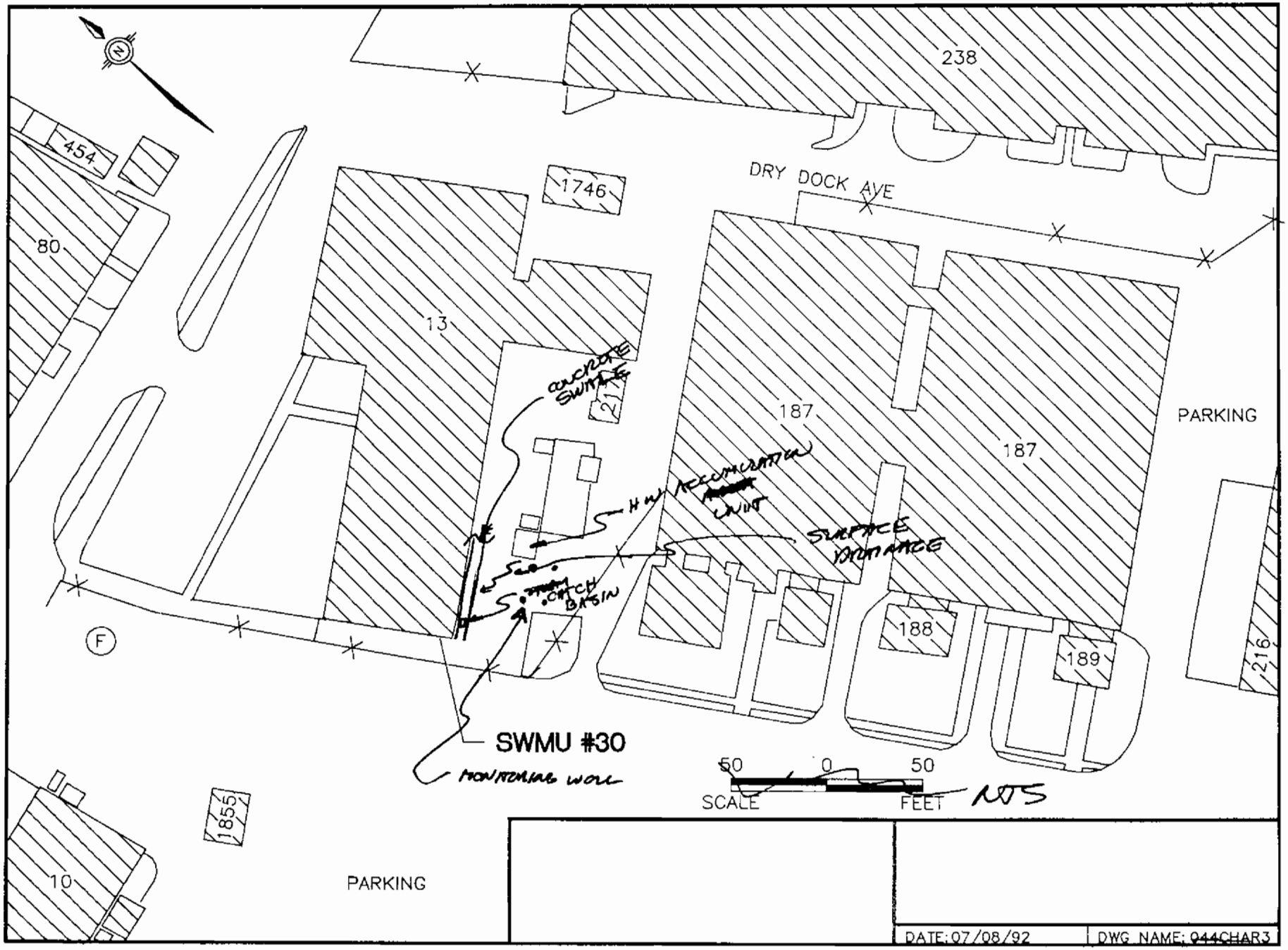
④ Composite Groups

o Sample Locations

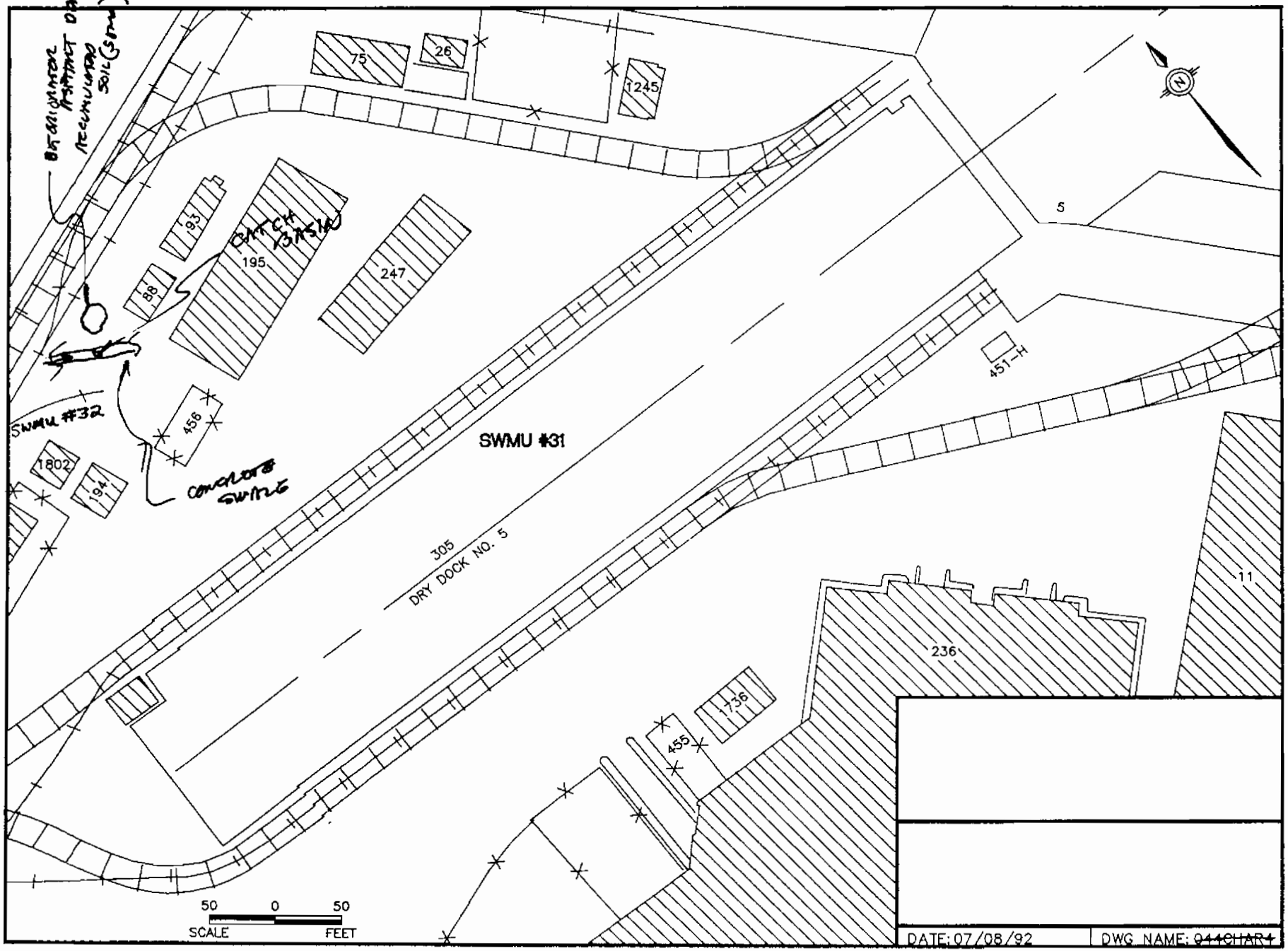
029CMARC


X10
X12
1431
SWMU #34
SWMU #29
PARKING
50 0 50
SCALE FEET
DWG DATE: 07/20/92
DWG NAME: 029CHR14

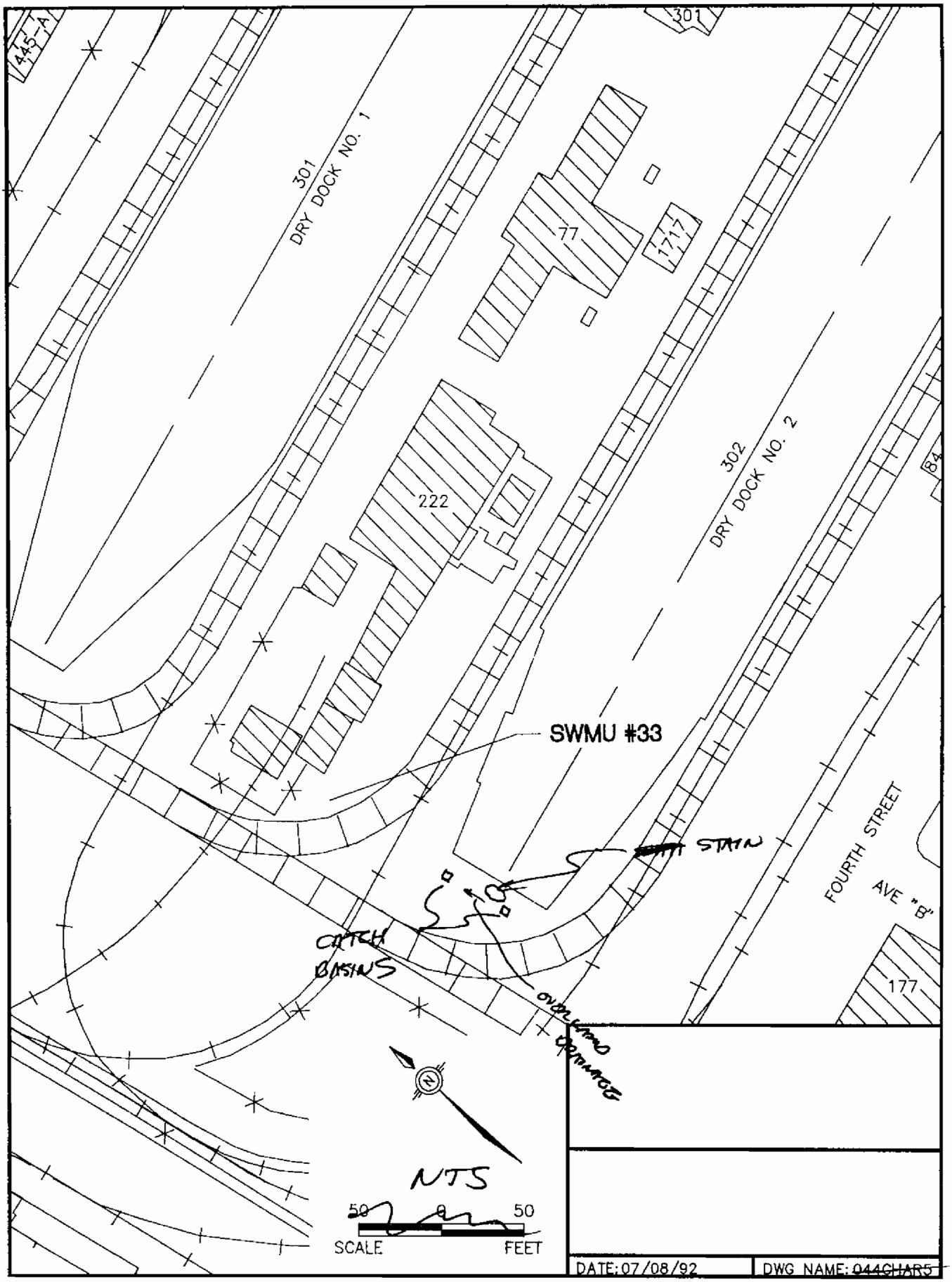
SWALE



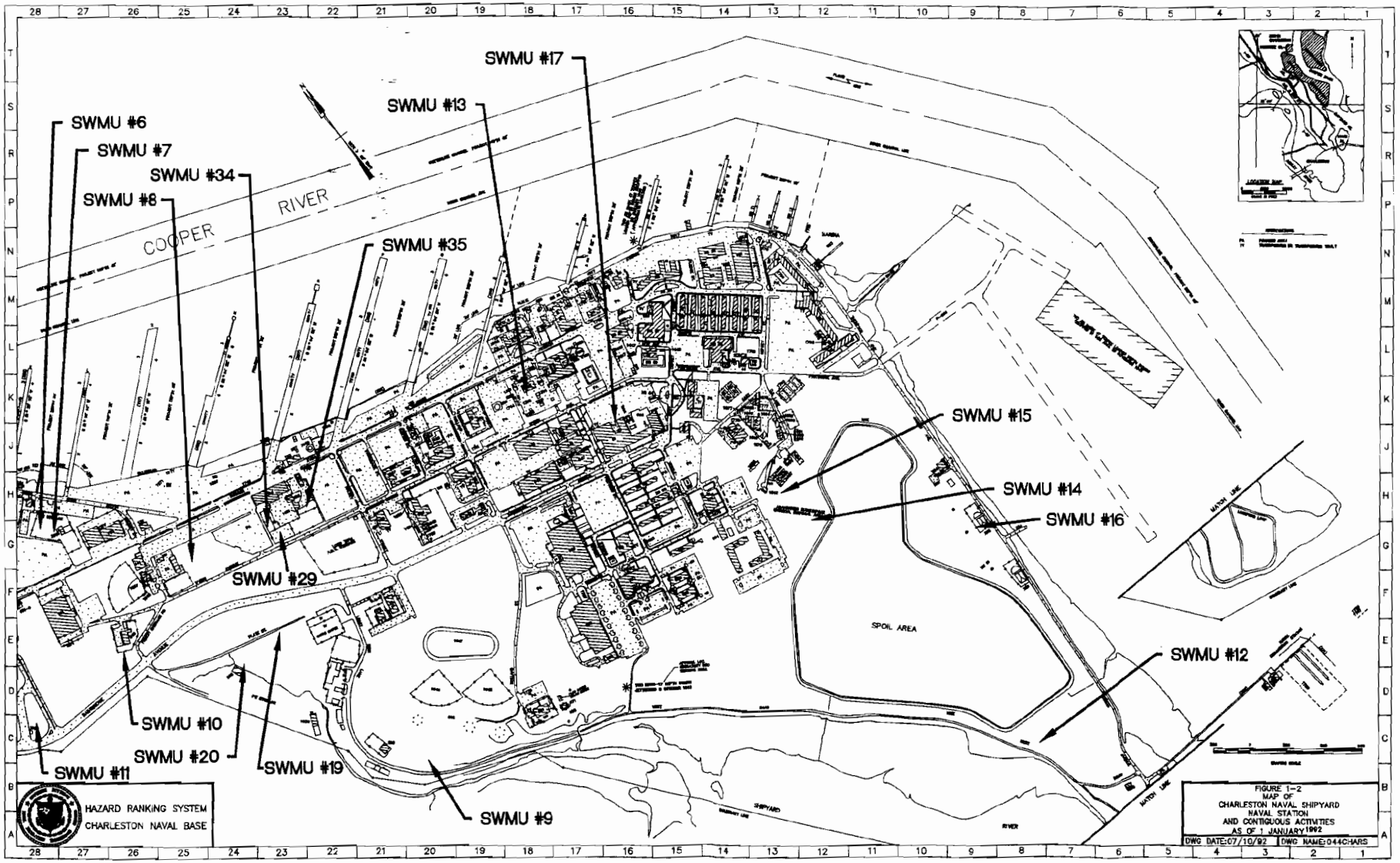
044CHAR7


SWMU #31
SWMU #32
DRY DOCK NO. 5
305
75
26
1245
93
88
195
247
456
1802
194
451-4
5
11
236
736
455
50 0 50
SCALE FEET
DATE: 07/08/92
DWG NAME: 944CHAR4

029CHAR4


445-A
301
301
DRY DOCK NO. 1
77
1717
222
302
DRY DOCK NO. 2
84
SWMU #33
STAIN
CATCH BASINS
OVERLAND DRAINAGE
FOURTH STREET
AVE "B"
177
NTS
50
0
50
SCALE
FEET
DATE: 07/08/92
DWG NAME: 044CHAR5

029CHARS


SWMU #17
SWMU #13
SWMU #6
SWMU #7
SWMU #34
SWMU #8
COOPER RIVER
SWMU #35
SWMU #15
SWMU #14
SWMU #16
SWMU #29
SPOIL AREA
SWMU #12
SWMU #10
SWMU #20
SWMU #19
SWMU #11
SWMU #9
HAZARD RANKING SYSTEM
CHARLESTON NAVAL BASE
FIGURE 1-2
MAP OF
CHARLESTON NAVAL SHIPYARD
NAVAL STATION
AND CONTIGUOUS ACTIVITIES
AS OF 1 JANUARY 1992
DWG DATE:07/10/92
DWG NAME:044CHARS

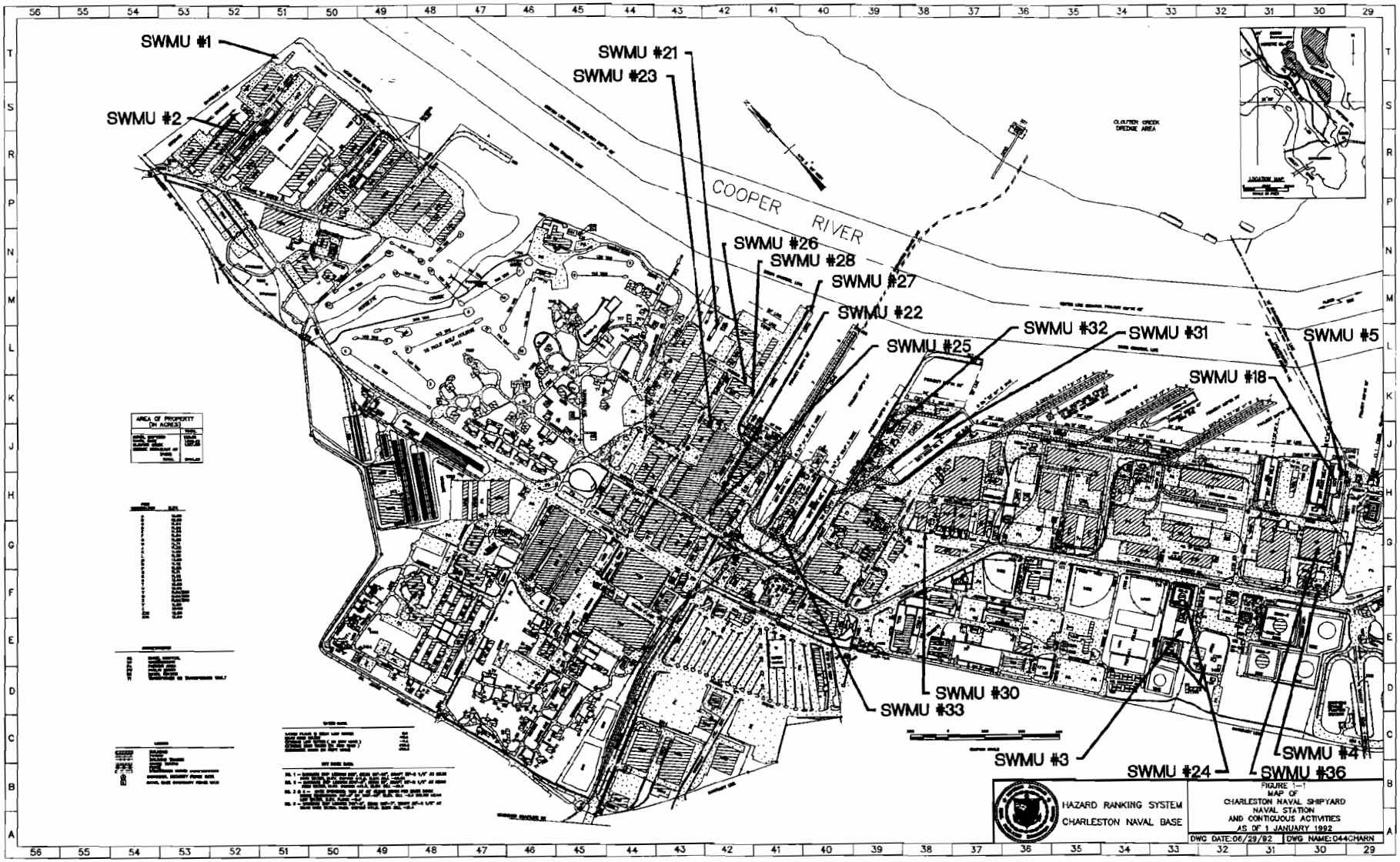

SWMU #1
SWMU #2
SWMU #21
SWMU #23
SWMU #26
SWMU #28
SWMU #27
SWMU #22
SWMU #25
SWMU #32
SWMU #31
SWMU #5
SWMU #18
SWMU #30
SWMU #33
SWMU #3
SWMU #24
SWMU #4
SWMU #36
COOPER RIVER
CLOUTER CREEK DREDGE AREA
HAZARD RANKING SYSTEM
CHARLESTON NAVAL BASE
FIGURE 1-1
MAP OF
CHARLESTON NAVAL SHIPYARD
NAVAL STATION
AND CONTIGUOUS ACTIVITIES
AS OF 1 JANUARY 1992
DWG DATE: 06/29/92
DWG NAME: 044CHARN

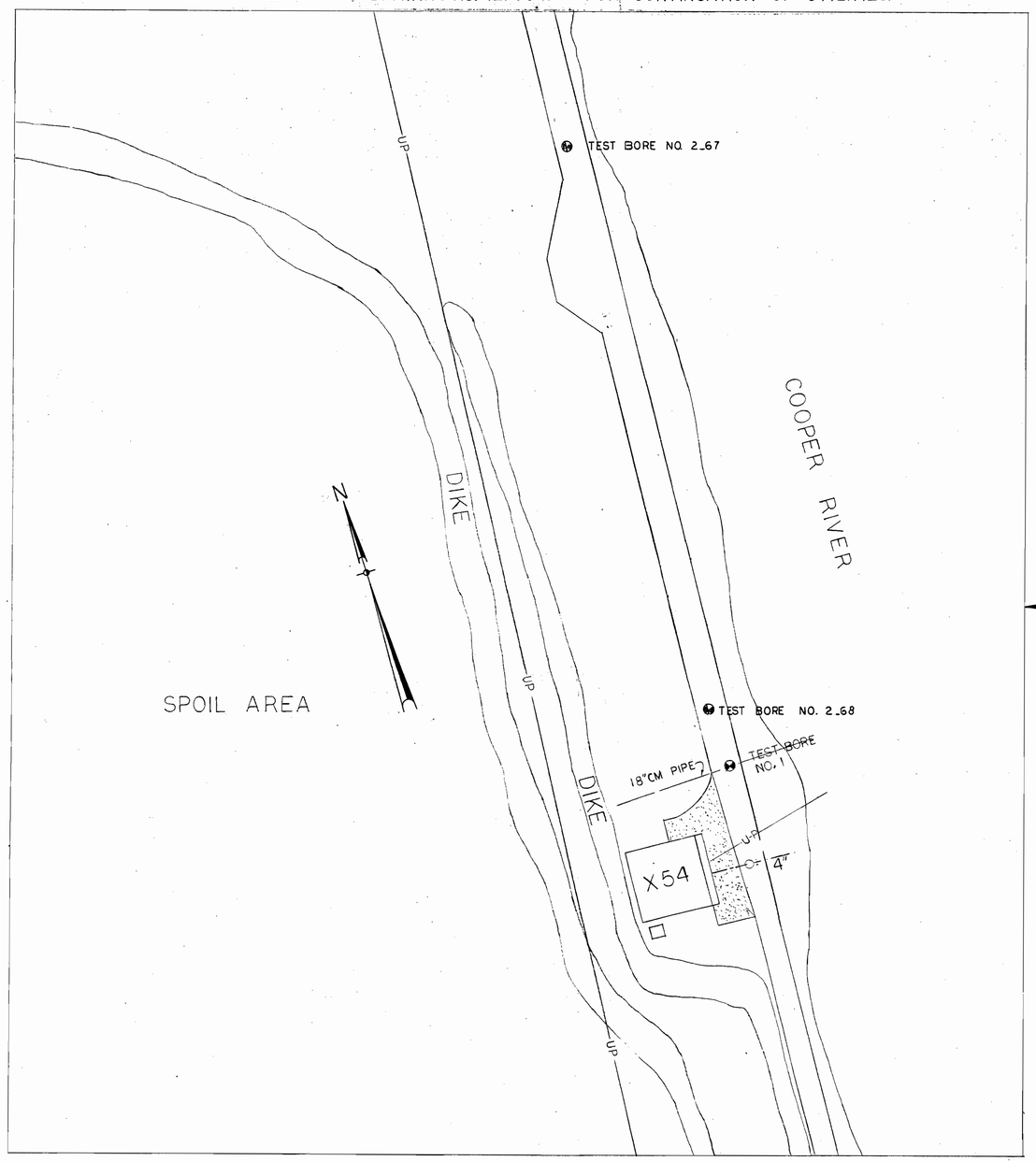
FIGURE 1-2
MAP OF
CHARLESTON NAVAL SHIPYARD
NAVAL STATION
AND CONTIGUOUS ACTIVITIES
AS OF 1 JANUARY 1992

DWG DATE: 06/29/92 | DWG NAME: 044CHARS


SWMU #1
SWMU #2
SWMU #3
SWMU #4
SWMU #5
SWMU #18
SWMU #21
SWMU #22
SWMU #23
SWMU #24
SWMU #25
SWMU #26
SWMU #27
SWMU #28
SWMU #30
SWMU #31
SWMU #32
SWMU #33
SWMU #36
COOPER RIVER
CLOUTER CREEK DREDGE AREA
18 HOLE GOLF COURSE
NOISETTE CREEK
INNER CHANNEL LINE
CENTER LINE CHANNEL PROJECT DEPTH 42'
BOUNDARY LINE
SEABOARD COASTLINE RR
LOCATION MAP
AREA OF PROPERTY (IN ACRES)
TOTAL
NAVAL SHIPYARD 120.80
NAVAL BASE 1396.43
CLOUTER CREEK 1397.00
DREDGE AREA (EAST OF RIVER)
TOTAL 2914.23
PIER DESIGNATION
ELEV.
ABBREVIATIONS
LEGEND
WATER DATA
DRY DOCK DATA
GRAPHIC SCALE
HAZARD RANKING SYSTEM
CHARLESTON NAVAL BASE
FIGURE 1-1
MAP OF
CHARLESTON NAVAL SHIPYARD
NAVAL STATION
AND CONTIGUOUS ACTIVITIES
AS OF 1 JANUARY 1992
DWG DATE:06/29/92
DWG NAME:044CHARN

REVISIONS				
LET	DESCRIPTION	PREP'D BY	DATE	APPROVED
	CORRECTED TO "AS-BUILT"	OLLNDIN	10/7/72	GETTER

SEE NAVFAC DRAWING NO. 1276647 FOR CONTINUATION OF UTILITIES.

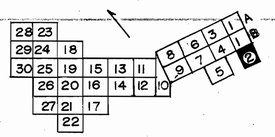


NO CONSTRUCTION, THIS AREA, THIS CONTRACT

LEGEND

	EXISTING	NEW
CONTOURS	~	
BITUMINOUS PAVING	▨	
CONCRETE PAVING	▨	
BUILDING	□	
UNDERGROUND POWER	—UP—	
GUY AND ANCHOR	—⊣	
POLE, HEIGHT & CLASS	○	
STORM SEWER	———	—10"SS→

	EXISTING	NEW
COMBINED SEWERS	———	
SANITARY SEWERS	———	—8"S→
SEWER MANHOLE	○	●-346
MANHOLE NUMBER		(20)
VALVE	—⋈—	
WATER LINE	—W—	
FENCE	—X—	



AREA INDEX

NOTE:
INFORMATION ON BUILDING CONNECTIONS TAKEN FROM EXISTING MAPS AND PHYSICAL EVIDENCE ABOVE GROUND. CONTRACTOR SHALL VERIFY LOCATION AND GRADE OF ALL BUILDING CONNECTIONS PRIOR TO CONSTRUCTION OF ADJACENT SEWERS.

SCALE IN FEET
50 0 50 100

DATUM IS MEAN LOW WATER

H410—8

RECORD DRAWING
DATE 10 APR 1974
SHEET 7 OF 89

B.P. BARBER & ASSOC., INC.
COLUMBIA, S.C.
ENGINEERS

DES. Browne DR. Berrio CHK. Williamson
SUPV. Williamson CH.ENGR. W Brown
SUBMITTED BY Brandt D. Williamson, ASSOC. 4-12-68 DATE
FIRM MEMBER (TITLE)
SOEAST DIV. NFEC-DESIGN DIVISION
P.O.E. BRADLEY DIR. C.O. Hall
APPROVED DATE
OFFICER IN CHARGE
APPROVED FOR COMMAND DATE
FOR COMMANDER, NAVFAC

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHEAST DIVISION
CHARLESTON, S. C.

NAVAL BASE CHARLESTON, S.C.

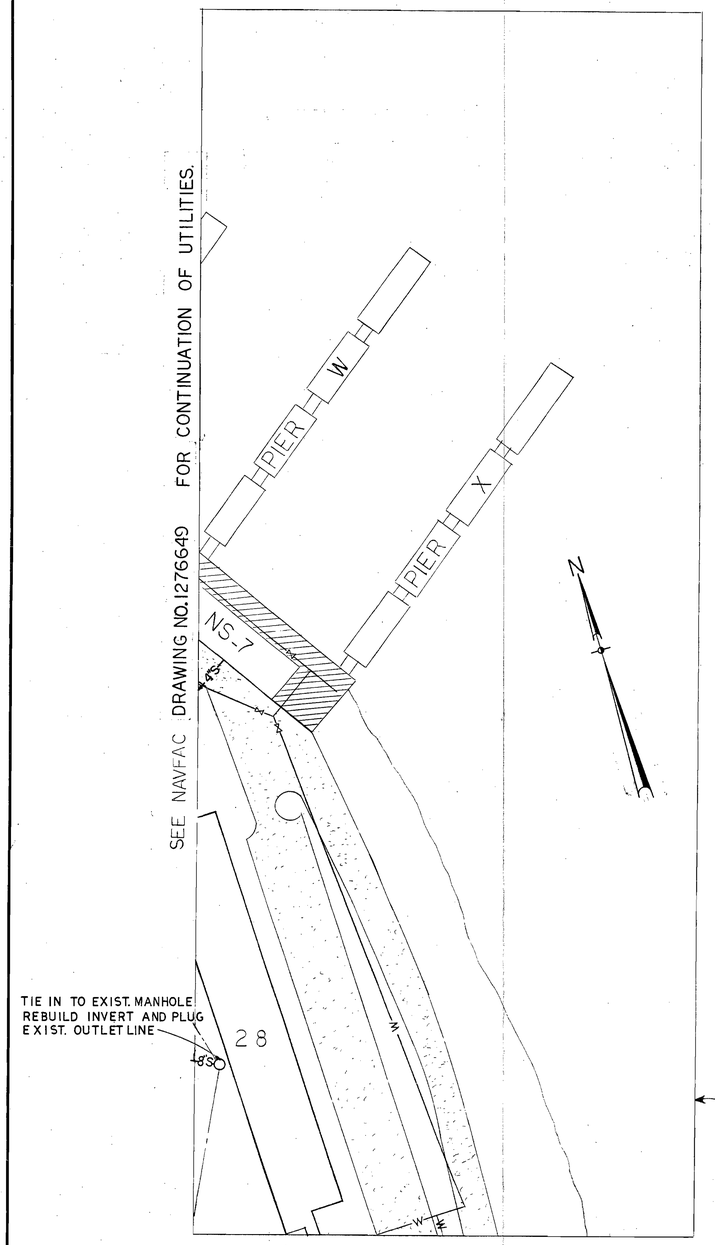
SANITARY & INDUSTRIAL SEWER SYSTEM
SITE PLAN AREA 2

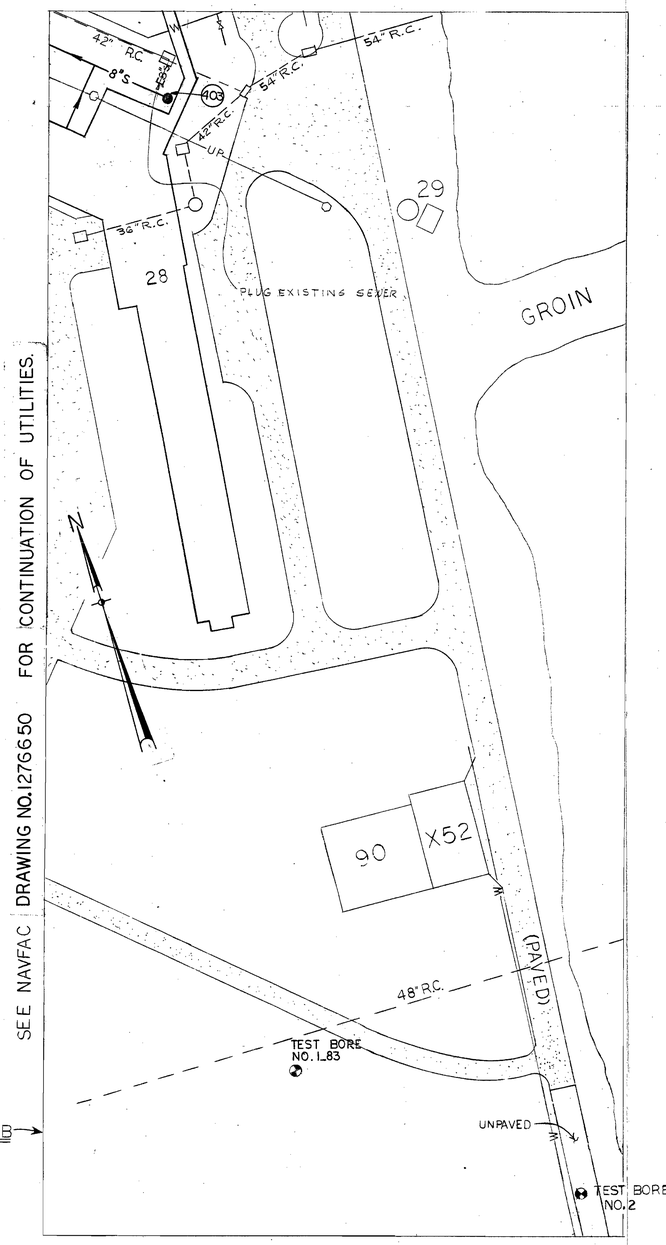
SIZE	CODE IDENT. NO.	NAVFAC DRAWING NO.
F	80091	1276648

CONSTR. CONTR. NO. N62467-67 C-0344
SCALE 1" = 50' SPEC. 52410/47/Rev-2 SHEET 7 OF 89

STANDARD PRODUCTS INC., PORT WASHINGTON, N.Y.

REVISIONS				
LET	DESCRIPTION	PREP'D BY	DATE	APPROVED
.	CORRECTED TO AS-BUILT	BLANDIN	10/17/72	GETTER





SEE NAVFAC DRAWING NO. 1276648 FOR CONTINUATION OF UTILITIES.

DATUM IS MEAN LOW WATER

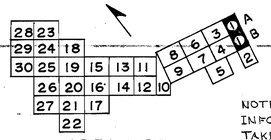
NOTE: ALL SERVICES TO BE 4", UNLESS OTHERWISE NOTED. CLASS I BEDDING.

RECORD DRAWING
DATE 10 APR 1974
SHEET 6 OF 89

H410-7

LEGEND

	EXISTING	NEW		EXISTING	NEW
CONTOURS	~		COMBINED SEWERS	—·—·—	
BITUMINOUS PAVING	▨		SANITARY SEWERS	—·—·—	—8"S→
CONCRETE PAVING	▨		SEWER MANHOLE	○	●—(342)
BUILDING	□		DROP INLET	□	■
UNDERGROUND POWER	—UP—		VALVE	—⋈—	
GUY AND ANCHOR	—→|		WATER LINE	—W—	
POLE, HEIGHT & CLASS	○		FENCE	—X—	
STORM SEWER	———	—10"SS→	ELECTRIC MANHOLE	○	



AREA INDEX

NOTE:
INFORMATION ON BUILDING CONNECTIONS TAKEN FROM EXISTING MAPS AND PHYSICAL EVIDENCE ABOVE GROUND. CONTRACTOR SHALL VERIFY LOCATION AND GRADE OF ALL BUILDING CONNECTIONS PRIOR TO CONSTRUCTION OF ADJACENT SEWERS.

SCALE IN FEET
50 0 50 100

B.P. BARBER & ASSOC., INC. COLUMBIA, S.C. ENGINEERS
DES. Browne | DR. Bergin | CHK. Williamson
SUPV. Williamson | CH. ENGR. Wilson
SUBMITTED BY 4-12-68 DATE
FIRM MEMBER (TITLE)
SOEAST DIV. NFEC-DESIGN DIVISION
PDE BRADLEY DIR.
APPROVED DATE
OFFICER IN CHARGE
APPROVED FOR COMMAND 5/22/68 DATE
FOR COMMANDER, NAVFAC

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHEAST DIVISION
CHARLESTON, S. C.
NAVAL BASE CHARLESTON, S.C.

SANITARY & INDUSTRIAL SEWER SYSTEM
SITE PLAN AREA 1

SIZE	CODE IDENT. NO.	NAVFAC DRAWING NO.
F	80091	1276647

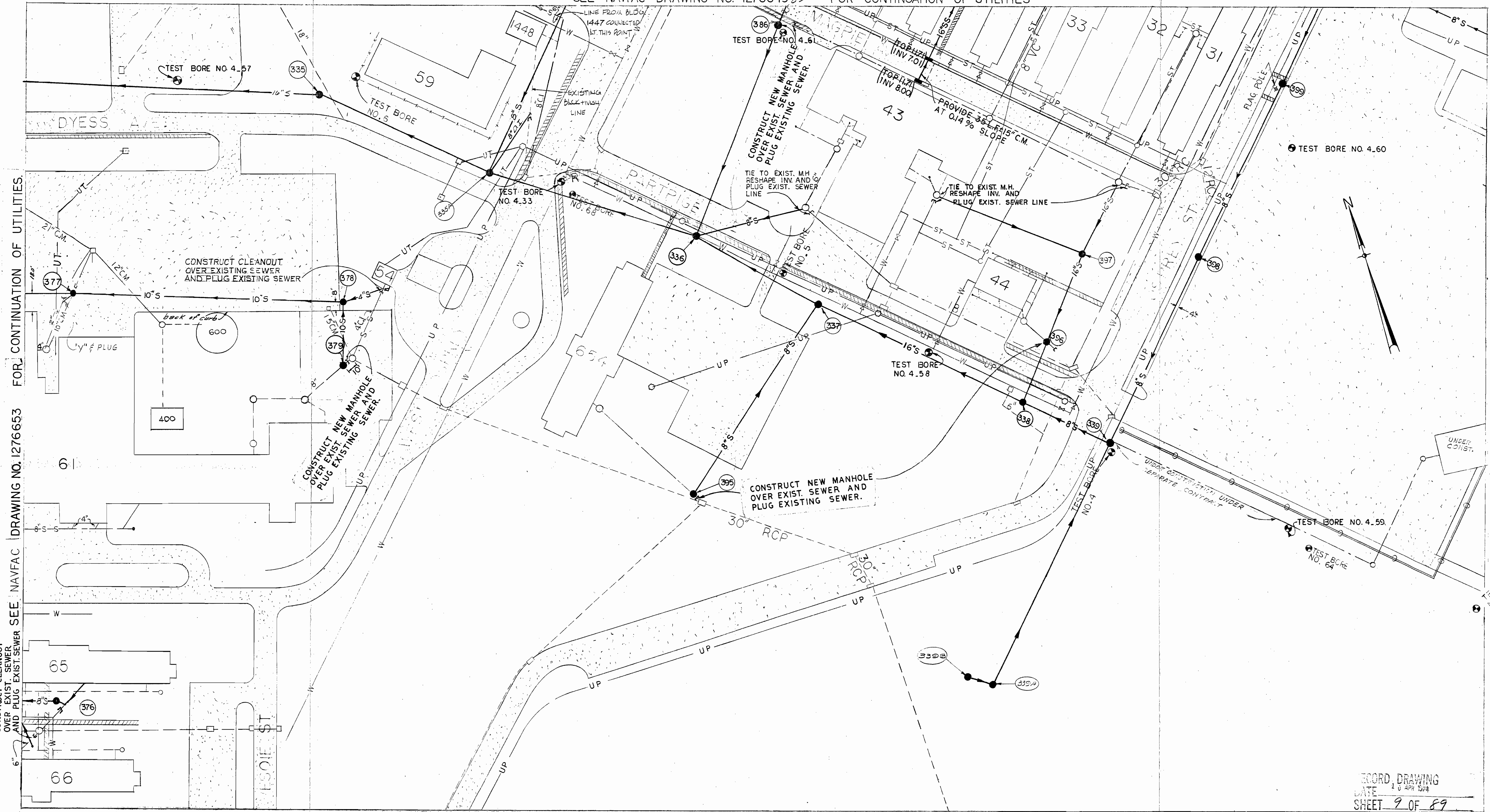
CONSTR. CONTR. NO. N62467-67 C-0344
SCALE 1" = 50' SPEC. 64119/67 REV-2. SHEET 6 OF 89

REVISIONS				
LET	DESCRIPTION	PREP'D BY	DATE	APPROVED
	CORRECTED TO AS-BUILT			GETTER

SEE NAVFAC DRAWING NO. 1276649 8's FOR CONTINUATION OF UTILITIES

SEE NAVFAC DRAWING NO. 1276653 FOR CONTINUATION OF UTILITIES.

SEE NAVFAC DRAWING NO. 1276647 FOR CONTINUATION OF UTILITIES.



RECORD DRAWING
DATE 10 APR 1974
SHEET 9 OF 89

LEGEND

	EXISTING	NEW		EXISTING	NEW
CONTOURS			COMBINED SEWERS		
BITUMINOUS PAVING			SANITARY SEWERS		8"S
CONCRETE PAVING			SEWER MANHOLE		341
BUILDING			DROP INLET		
UNDERGROUND POWER	UP		VALVE		
GUY AND ANCHOR			WATER LINE	W	
POLE, HEIGHT & CLASS			FENCE	X	
STORM SEWER		10"SS	ELECTRIC MANHOLE		
STEAM	ST		ANODE FIELD		
UNDERGROUND TELEPHONE	UT				

SEE NAVFAC DRAWING NO. 1276651 FOR CONTINUATION OF UTILITIES.

AREA INDEX

NOTE:
INFORMATION ON BUILDING CONNECTIONS TAKEN FROM EXISTING MAPS AND PHYSICAL EVIDENCE ABOVE GROUND. CONTRACTOR SHALL VERIFY LOCATION AND GRADE OF ALL BUILDING CONNECTIONS PRIOR TO CONSTRUCTION OF ADJACENT SEWERS.

GRAPHIC SCALE
SCALE IN FEET
50 0 50 100

H410—10

DATUM IS MEAN LOW WATER

NOTE: ALL SERVICES TO BE 4", UNLESS OTHERWISE NOTED. CLASS I BEDDING.

B.P. BARBER & ASSOC., INC.
COLUMBIA, S.C.
ENGINEERS

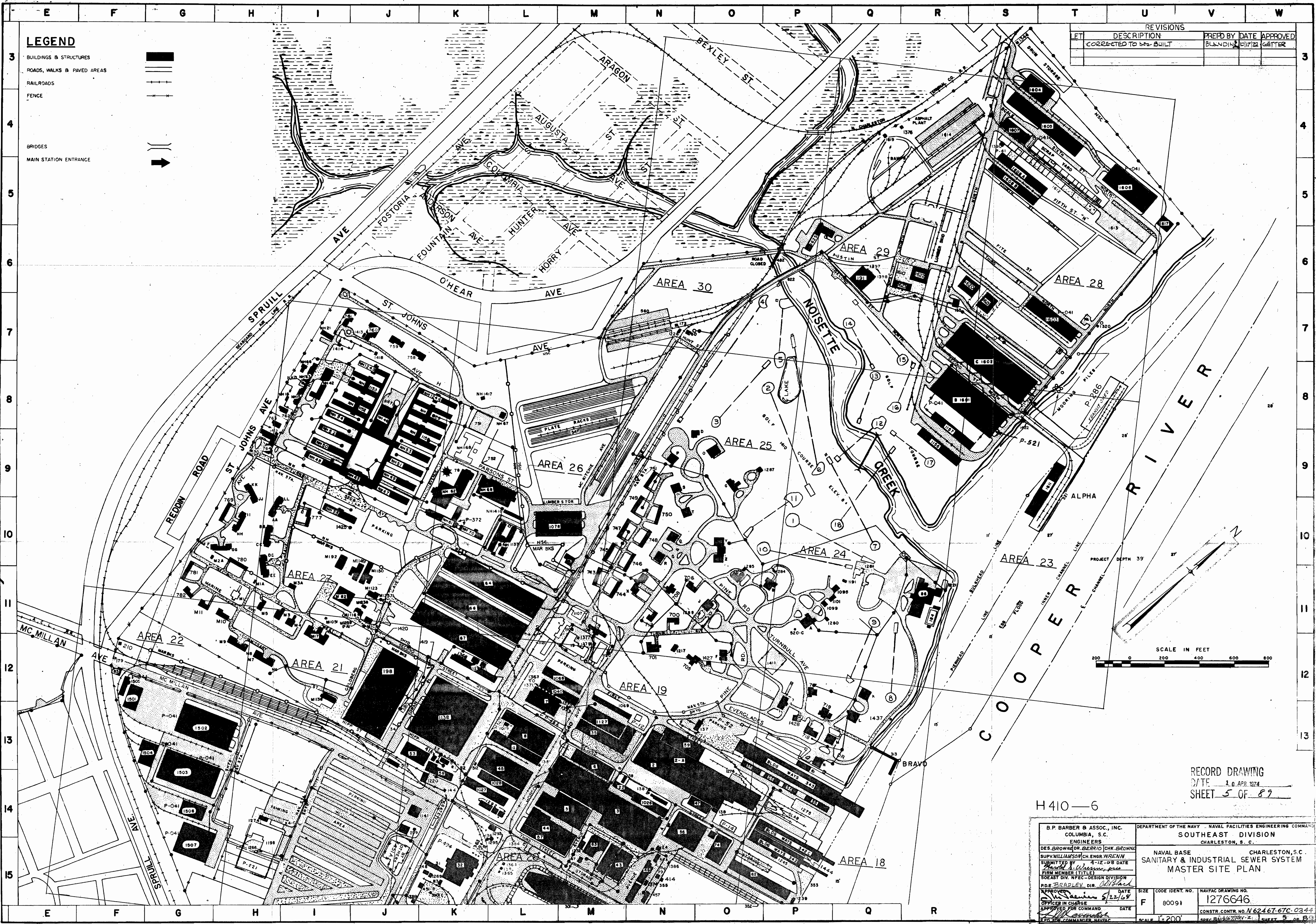
DES. Browne DR. Berrio CHK. Williamson
SUPV. Williamson CH. ENGR. Wrenn
SUBMITTED BY 4-12-68 DATE
Harold L. Wrenn, Pres.
FIRM MEMBER (TITLE)
SOEAST DIV. NFEC—DESIGN DIVISION
P.D.E. BRADLEY DIR. C.A. Black
APPROVED DATE
OFFICER IN CHARGE
APPROVED FOR COMMAND DATE
EFD FOR COMMANDER, NAVFAC

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHEAST DIVISION
CHARLESTON, S. C.

NAVAL BASE CHARLESTON, S.C.

SANITARY & INDUSTRIAL SEWER SYSTEM SITE PLAN AREA 4

SIZE	CODE IDENT. NO.	NAVFAC DRAWING NO.
F	80091	1276650
		CONSTR. CONTR. NO. N62467-67 C-0344
SCALE 1"=50'		SPEC 84119/67/REV-2 SHEET 9 OF 89



LET	DESCRIPTION	PREP'D BY	DATE	APPROVED
	CORRECTED TO AS-BUILT	BLANDING	10/17/72	GETTER

RECORD DRAWING
DATE 10 APR 1974
SHEET 5 OF 89

H410—6

B.P. BARBER & ASSOC., INC.
COLUMBIA, S.C.
ENGINEERS

DEPARTMENT OF THE NAVY · NAVAL FACILITIES ENGINEERING COMMAND
SOUTHEAST DIVISION
CHARLESTON, S. C.

NAVAL BASE CHARLESTON, S.C.
SANITARY & INDUSTRIAL SEWER SYSTEM
MASTER SITE PLAN

DES. BROWNE DR. BERRIO CHK. BROWNE
SUPV. WILLIAMSON CH. ENGR. WRENN
SUBMITTED BY 4-12-68 DATE
FIRM MEMBER (TITLE)
SOEAST DIV. NFEC-DESIGN DIVISION
P.D.E. BRADLEY DIR.
APPROVED DATE 5/22/68
OFFICER IN CHARGE
APPROVED FOR COMMAND DATE
FOR COMMANDER NAVFAC

SIZE F
CODE IDENT. NO. 80091
NAVFAC DRAWING NO. 1276646
CONSTR. CONTR. NO. N 62467-67C-0344
SCALE 1"=200'
SPEC 84/67/REV-2 SHEET 5 OF 89